



# Monsoon Recap 2014



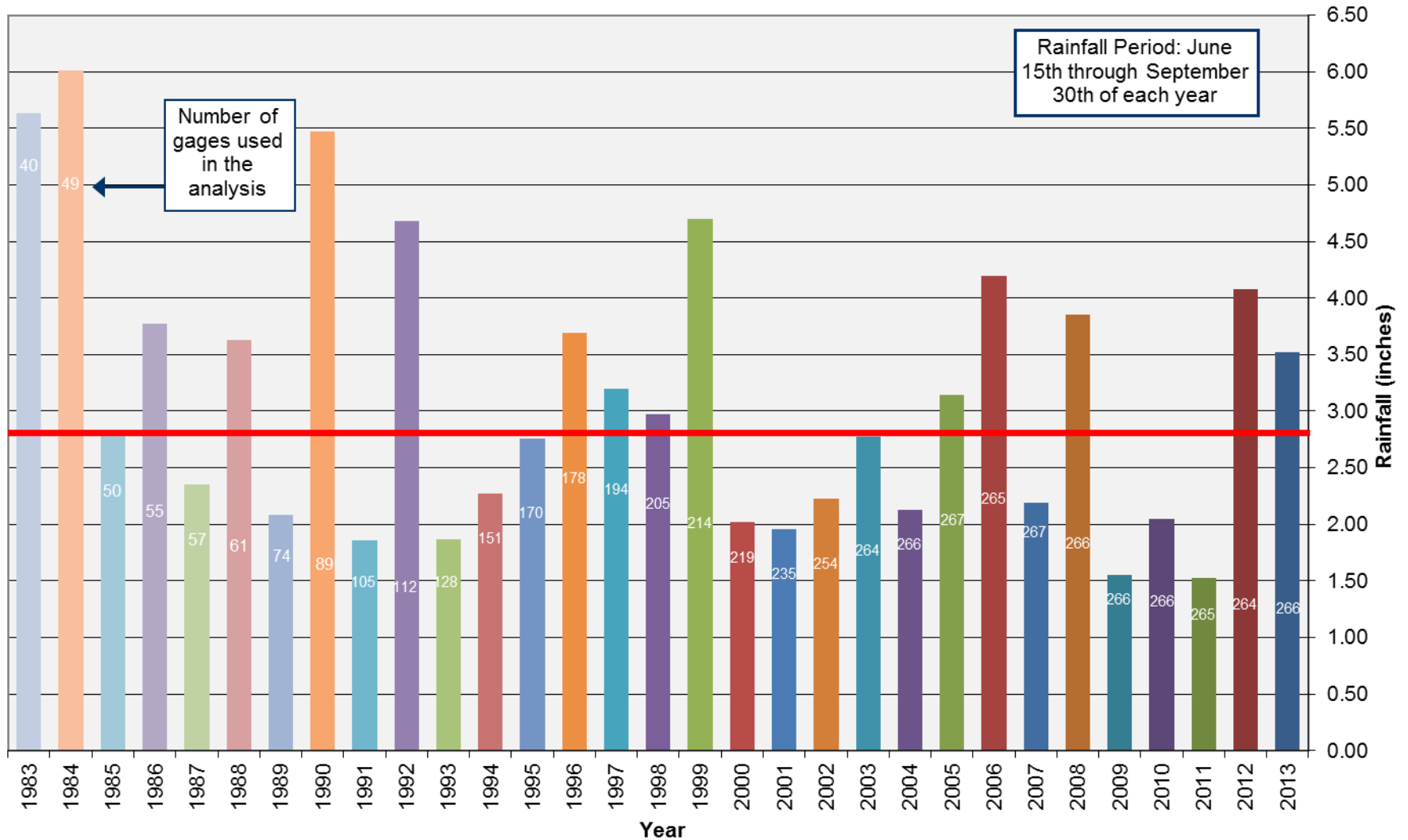
Monsoon t-storm looking WNW from Papago Park, 08-17-2014, D. Henz

**Steve Waters**  
Hydrologist/Branch Manager

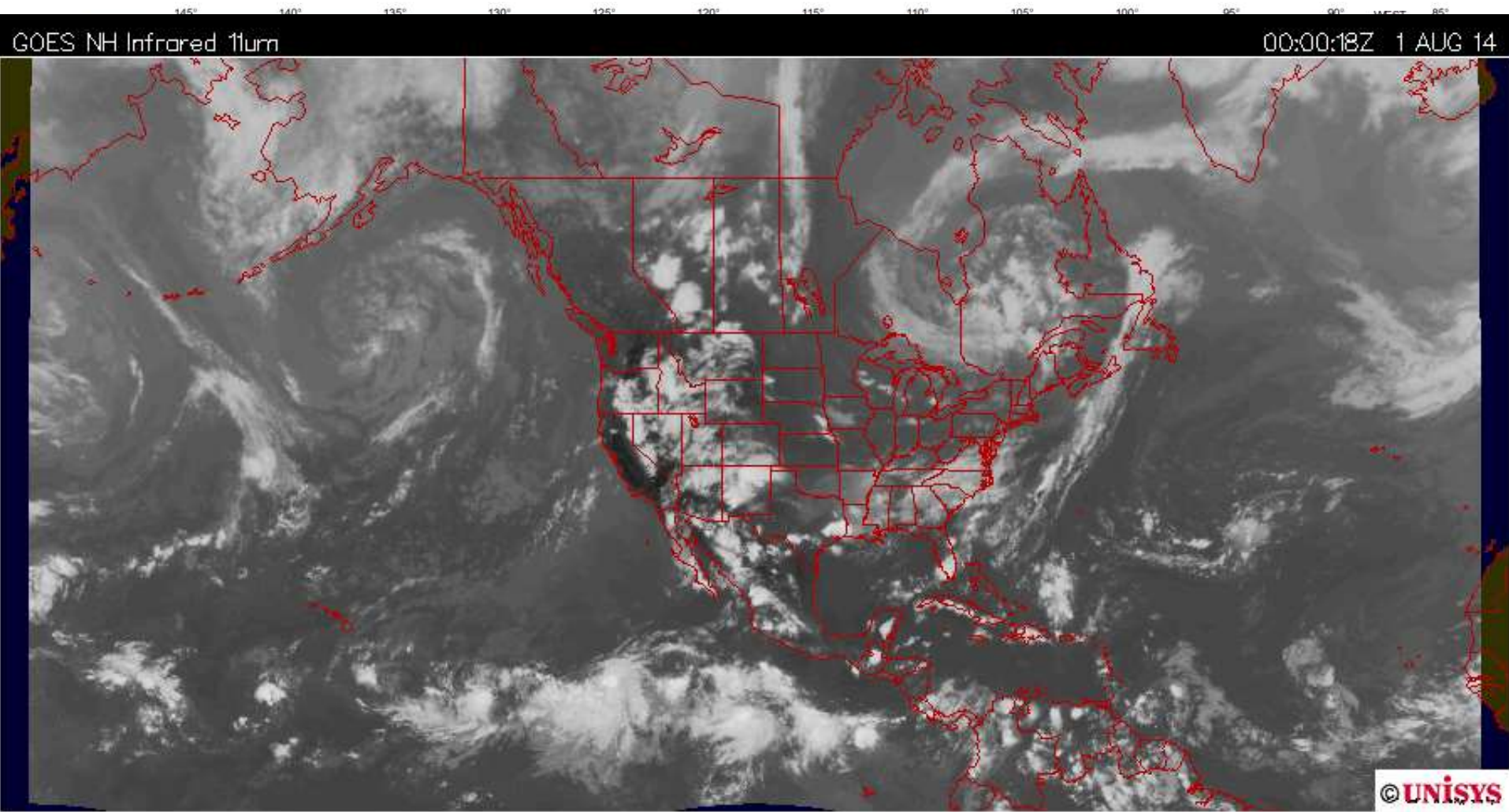
**Daniel Henz**  
Meteorologist

## Average Summer Thunderstorm Season Rainfall

Flood Control District of Maricopa County ALERT Rain Gages



# 2014 Tropical Cyclones





TUESDAY, AUGUST 12, 2014

## Laveen's 960-Year Flood Event

The National Weather Service issued a flash flood warning for Maricopa County on Tuesday, August 12, however no one could have predicted the flooding that would occur in the South Mountain area that evening.

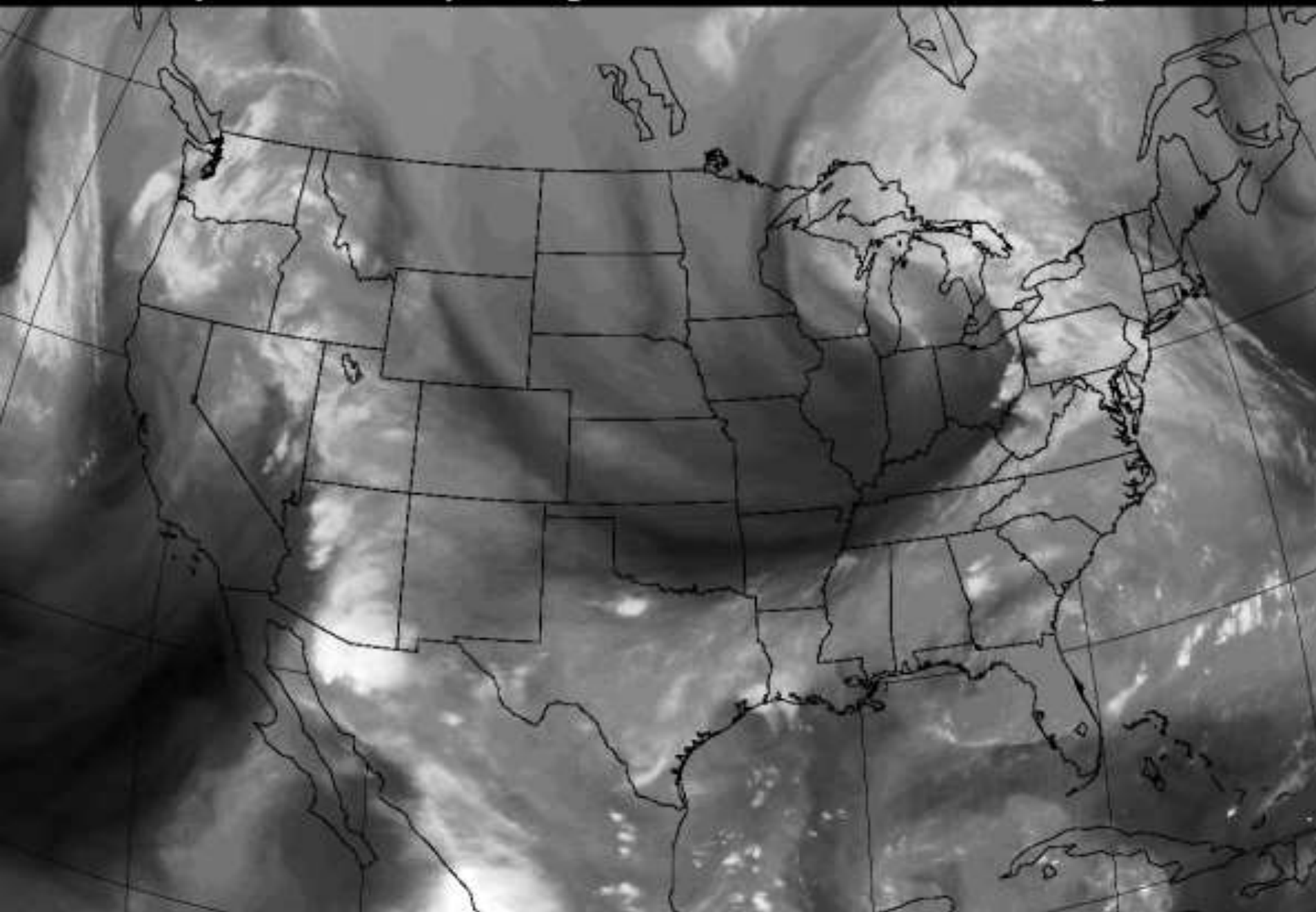
The monsoon storm dropped over 2.5 inches of rain in south Phoenix over a period of several hours. Sixteen people had to be rescued in Laveen after water from an overflowing canal poured onto Dobbins Road near 19th Avenue. Runoff from the mountains transformed normally quiet neighborhood streets into fast-flowing rivers. Floodwaters from the streets quickly topped curbs, seeped into yards and eventually into the homes of multiple homeowners. What was already a horrible situation for residents became devastating when they learned that their homes were insured for water damage but not flood damage. Instead of simply paying an insurance deductible, they would now be faced with tens-of-thousands of dollars in flood repairs.

The District received numerous calls about the assistance that would be provided to these affected homeowners. Our response, information. In addition to passing out pamphlets about the National Flood Insurance Program, the Floodplain Management and Services Division created a site on the District's webpage where anyone can learn the expenses associated with flood damage and how to avoid incurring those costs by obtaining flood insurance. We encourage you to share this site with your friends, family and our customers.

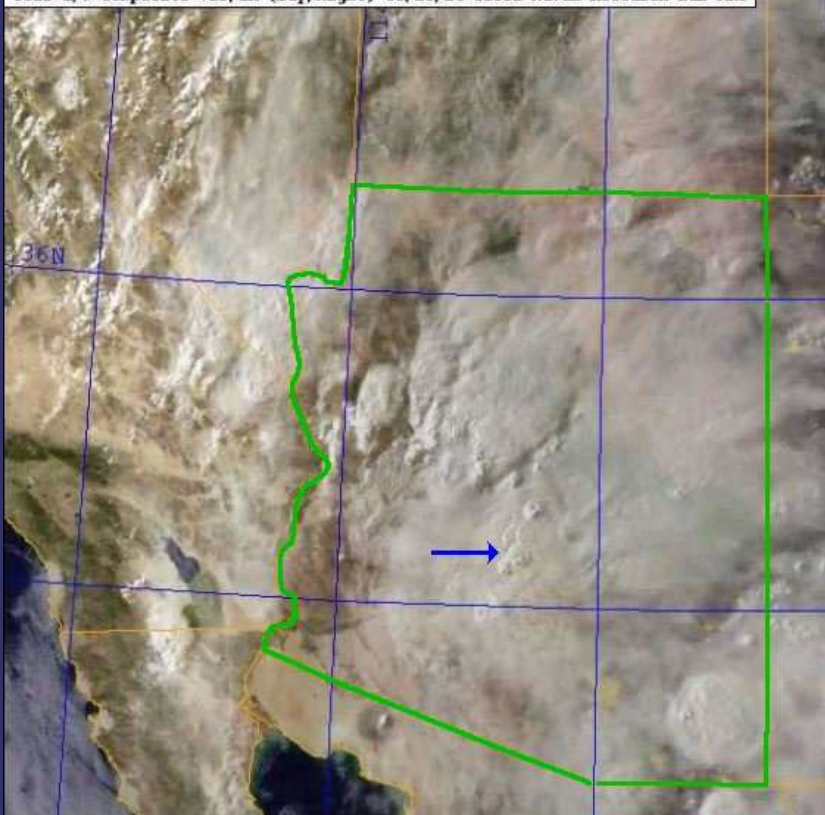


# MONSOON 2014









Precipitation Frequency Estimates (inches) for 33.347N 112.085W  
Depth-Duration-Frequency (DDF) Table, Annual Maximum Series  
From NOAA Atlas 14, Volume I, Version 5

TABLE 4

| AEP<br>(1-<br>in-Y) | 5<br>min | 10<br>min | 15<br>min | 30<br>min | 60<br>min | 90<br>min | 2<br>hr |
|---------------------|----------|-----------|-----------|-----------|-----------|-----------|---------|
| 2                   | 0.22     | 0.34      | 0.42      | 0.57      | 0.70      |           | 0.82    |
| 5                   | 0.33     | 0.50      | 0.62      | 0.84      | 1.03      |           | 1.19    |
| 10                  | 0.40     | 0.61      | 0.76      | 1.02      | 1.26      |           | 1.44    |
| 25                  | 0.49     | 0.75      | 0.93      | 1.25      | 1.55      |           | 1.78    |
| 50                  | 0.57     | 0.86      | 1.07      | 1.44      | 1.78      |           | 2.01    |
| 100                 | 0.64     | 0.97      | 1.20      | 1.62      | 2.01      |           | 2.27    |
| 200                 | 0.71     | 1.08      | 1.34      | 1.81      | 2.23      |           | 2.52    |
| 500                 | 0.81     | 1.23      | 1.52      | 2.05      | 2.54      |           | 2.85    |
| 1000                | 0.88     | 1.34      | 1.66      | 2.24      | 2.77      |           | 3.12    |



South Umi Park HO  
Station No. 6525  
02/11/2014

\* 90-minute values interpolated, not provided in NOAA 14.

AEP is Annual Exceedance Probability

|   |      |      |      |      |      |      |      |  |
|---|------|------|------|------|------|------|------|--|
| 1 | 0.47 | 0.89 | 1.16 | 1.64 | 2.35 | 2.43 | 2.48 | Recorded period rainfall from Gage No. 6525 (in)   |
|   | 20   | 60   | 81   | 108  | 285  | 214* | 179  | Return periods (years) - DDF for 6525  |
| 2 | 0.57 | 1.09 | 1.58 | 1.91 | 2.76 | 2.85 | 2.94 | Recorded period rainfall from CoCoRaHS Station No. AZ-MR-326; 2/3 mi. NW of Gage No. 6525 (in) |
|   | 50   | 213  | 673  | 293  | 970  | 743* | 630  | Return periods (years) - DDF for 6525  |
| 3 | 0.43 | 0.75 | 1.06 | 1.46 | 1.81 | 1.97 | 1.97 | Recorded period rainfall from Gage No. 4500 (in)   |
|   | 12   | 22   | 11   | 48   | 49   | 49*  | 45   | Return periods (years) - DDF for 4500  |

## LAVEEN BASIN #4578

### PROBLEM AREAS

None Identified



### STRUCTURE DATA

Maximum Depth..... 21.2 ft  
Spillway Elevation..... 20.0 ft  
Spillway Capacity..... 140 af  
Sensor Elevation..... 0.20 ft  
Invert Elevation..... 0.00 ft  
Zero Gage Height..... 1001.20 ft MSL

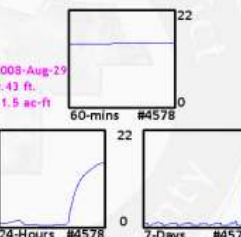
FIGURE 11

### POOL STAGE (FT)



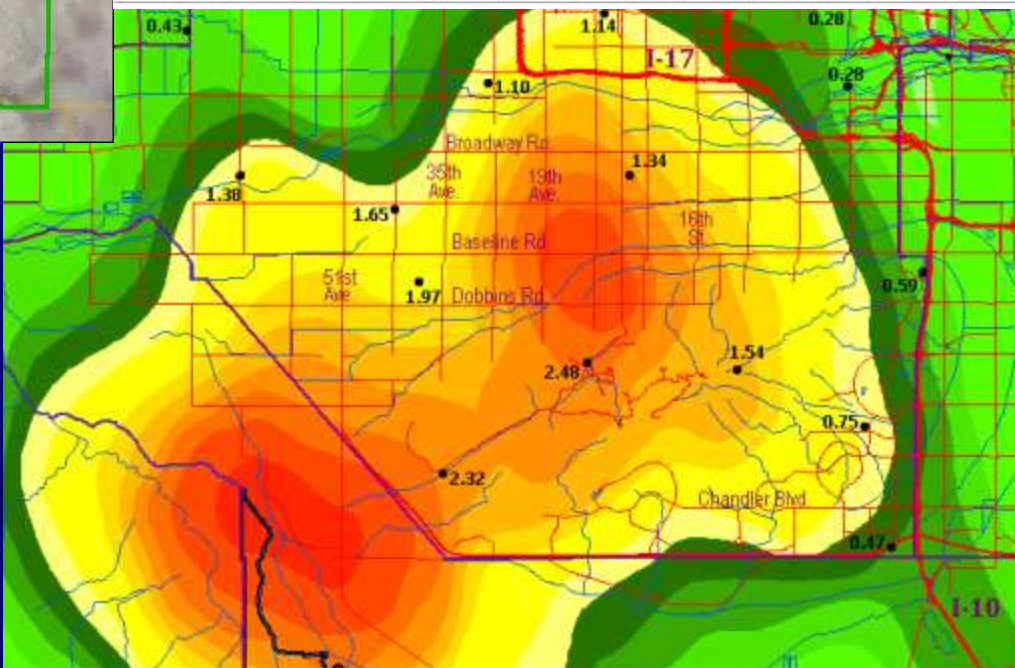
### CURRENT CONDITIONS

Elevation (ft) → 1015.95  
Stage (ft) → 14.75  
Discharge (cfs) → 1.2  
Storage (ac-ft) → 78.5  
Percent Full (%) → 56.0  
Drawdown (hrs) → 79.2



### BASIN RAINFALL

| Location            | 1hr  | 6hr  | 12hr | WY(tD) |
|---------------------|------|------|------|--------|
| Laveen Basin - 4578 | 0.00 | 0.00 | 1.69 | 5.20   |
| Cesar Chavez - 4500 | 0.00 | 0.00 | 2.01 | 5.27   |
| Ramsey 2nd - 4510   | 0.00 | 0.00 | 1.34 | 5.71   |



Gage-adjusted  
radar rainfall  
estimates -  
3-hours ending  
Aug. 12, 2014  
at 7:30 PM MST

• 1.97  
Inches of rain  
recorded at  
FCDMC gages

| Inches      |
|-------------|
| 0.04 - 0.24 |
| 0.25 - 0.43 |
| 0.44 - 0.63 |
| 0.64 - 0.83 |
| 0.84 - 1.02 |
| 1.03 - 1.22 |
| 1.23 - 1.61 |
| 1.62 - 1.81 |
| 1.82 - 2.01 |
| 2.02 - 2.20 |
| 2.21 - 2.40 |
| 2.41 - 2.60 |
| 2.61 - 2.80 |
| 2.81 - 3.19 |



## Maricopa County Storm Severity Index (MCS<sup>2</sup>I), developed by FCDMC

MCS<sup>2</sup>I is an index that classifies the severity of a storm based on the area covered, the average rainfall over that area (from gage-adjusted radar estimates), and the storm duration. For this storm, we chose the area from the watershed divide in South Mountain Park north to the Western Canal, and from 32<sup>nd</sup> St. to 51<sup>st</sup> Ave. The storm scores an MCS<sup>2</sup>I of **8.3**, categorized as **Severe** on the MCS<sup>2</sup>I Scale.

### THE MCS<sup>2</sup>I SCALE

|  |     |
|--|-----|
| <b>Devastating -</b><br>Most rivers, creeks and washes out of their banks; large-scale erosion; major damage to structures and properties        | 9.0 |
| <b>Severe -</b><br>Many rivers, creeks and washes out of their banks; bank & stream-bottom erosion; moderate damage to structures and properties | 8.0 |
| <b>Major -</b><br>Rivers, creeks and washes running near full; moderate bank erosion; widespread street flooding; sheetflow                      | 7.0 |
| <b>Strong -</b><br>Rivers, creeks and washes running; minor bank erosion; street flooding with debris; shallow sheetflow                         | 6.0 |
| <b>Moderate -</b><br>Tributary washes running; flow in streets; sediments begin to move  | 5.0 |
| <b>Minor -</b><br>Flow only on impervious surfaces; soils generally able to absorb precipitation   | 4.0 |
| <b>Light -</b><br>Precipitation falls but little if any runoff   | 3.0 |

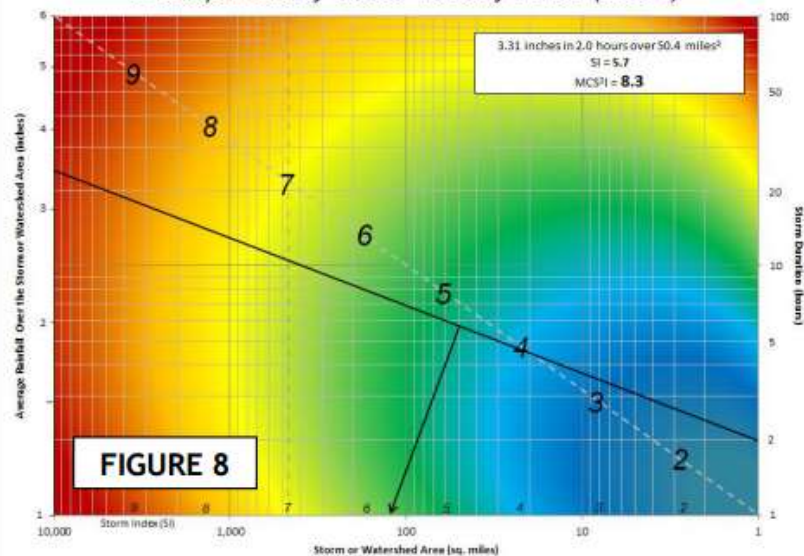
FIGURE 7

New River Watershed - Jan. 21, 2010

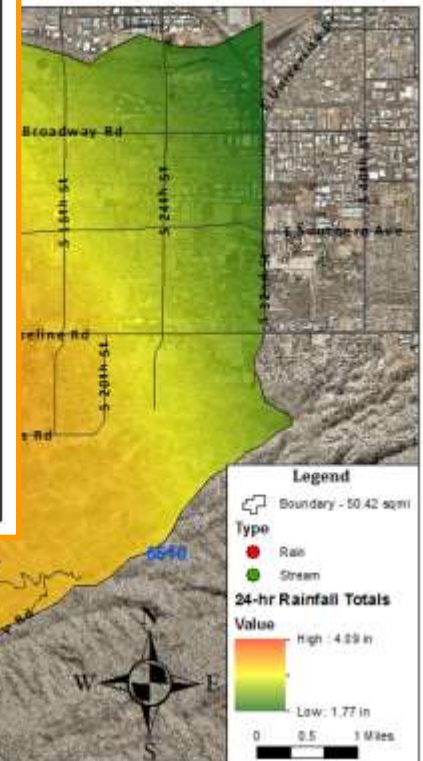
Vekol Wash Watershed - Aug. 27, 2010

100-year Design Rainfall

### Maricopa County Storm Severity Index (MCS<sup>2</sup>I)



August 12, 2014  
4 9:00am  
Volume of Water: 8,901 ac-ft







TUESDAY, AUGUST 19, 2014

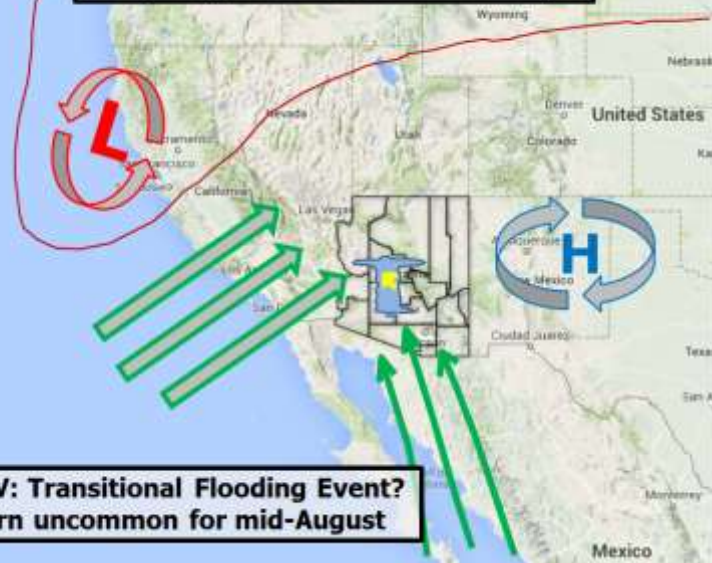
## Flash Floods, New River and Storm Water Rescues

Heavy rain and strong winds had a huge impact on the Tuesday, August 19 morning commute for valley residents. What many believed would be an average monsoon storm quickly became much more than typical. By ten o'clock in the morning, news stations valley wide were reporting multiple flash floods, flowing washes and streets that were being inundated with floodwater. Plastic plant pots floating in the muddy water became ominous visuals and a reminder of a plant nursery that was destroyed and lost over \$2 million in inventory.

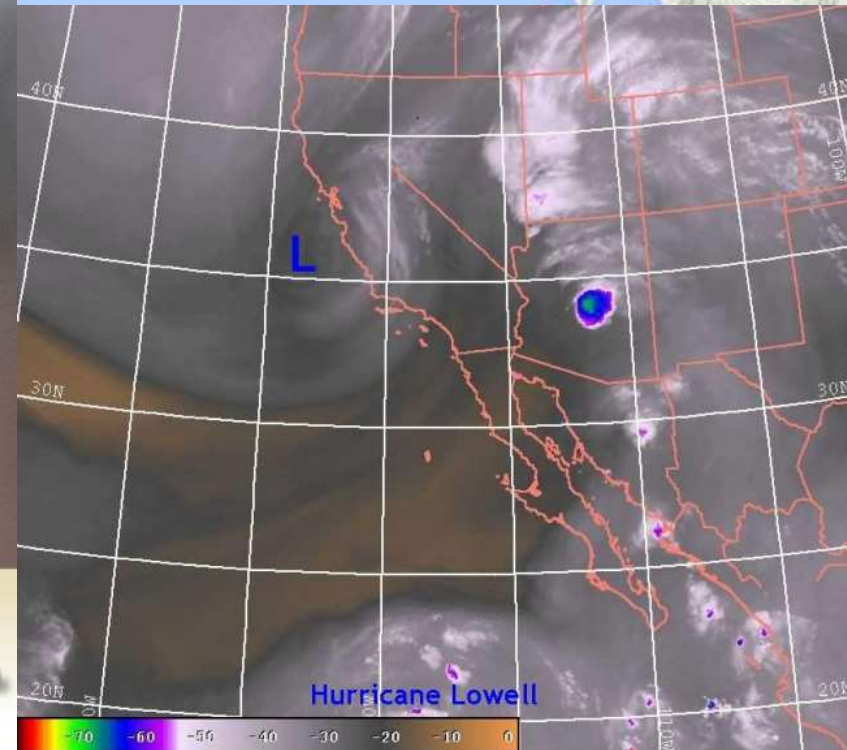
By 10:30 a.m., Phoenix was receiving national attention from media outlets because a busy interstate had turned into a wild river due to floodwater that had over-topped nearby Skunk Creek. The images were equally amazing and terrorizing. There was no place to turn around to avoid the water so drivers reluctantly drove through it. The nation watched as Arizonans, water sometimes surpassing their headlights, pushed through to make it to safety.

Meanwhile, New River was proving that its title had been earned; there was in fact a new river running through north Phoenix as a result of over five inches of heavy rain that fell over the area. Homes were being torn from their very foundations. Some residents were able to get to safety while others found themselves trapped in their homes. Again, the nation watched as swift-water rescuers worked efficiently to save the lives of citizens that found themselves caught in flash floods.

## 08/19/14 Weather Setup

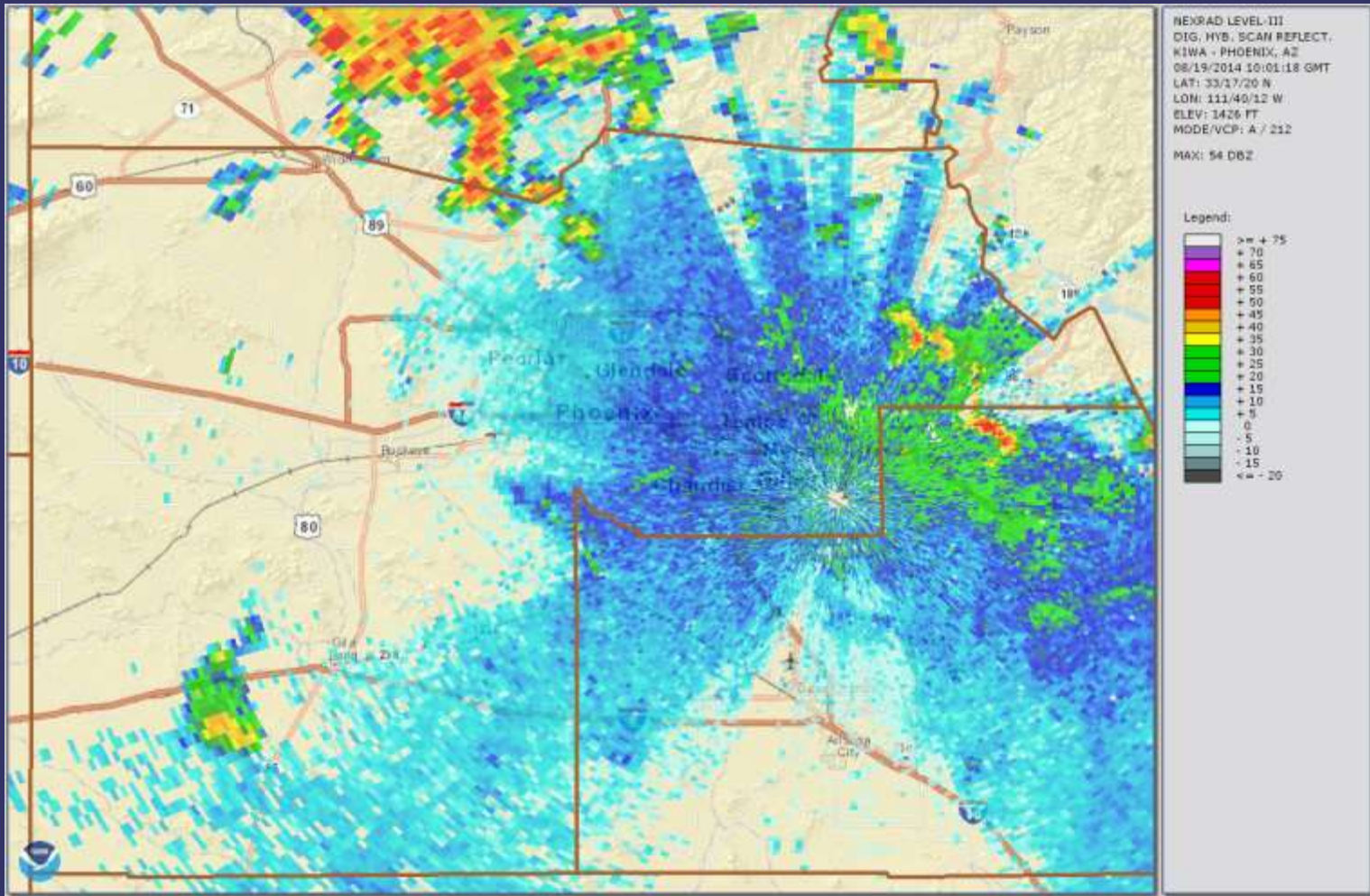


**Type IV: Transitional Flooding Event?**  
Pattern uncommon for mid-August

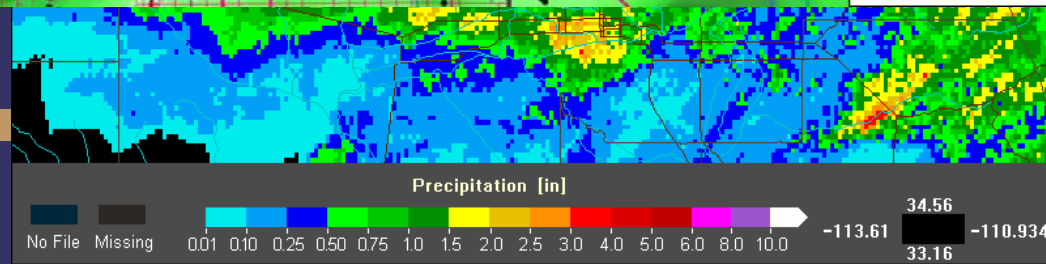
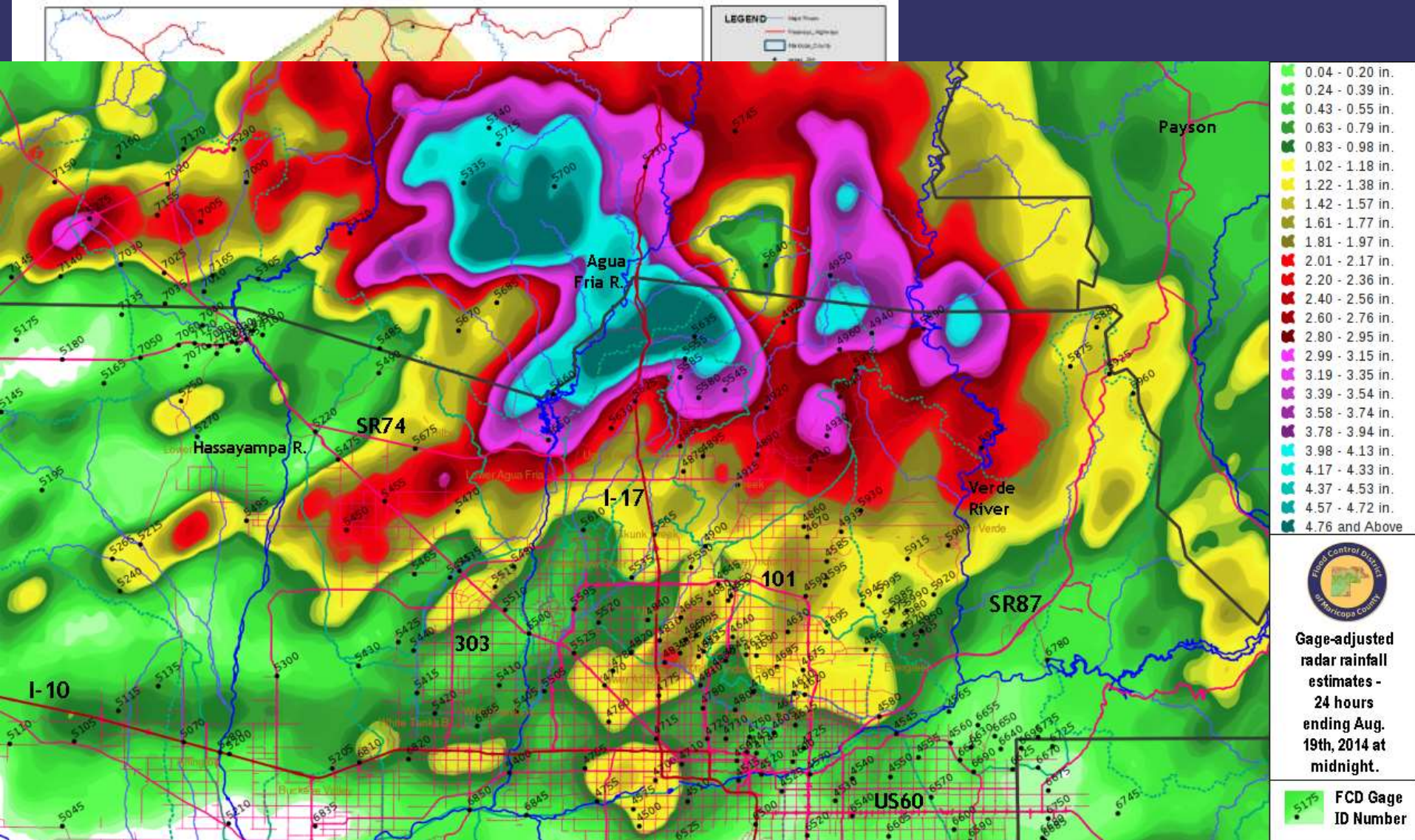




# August 19<sup>th</sup> Radar Loop



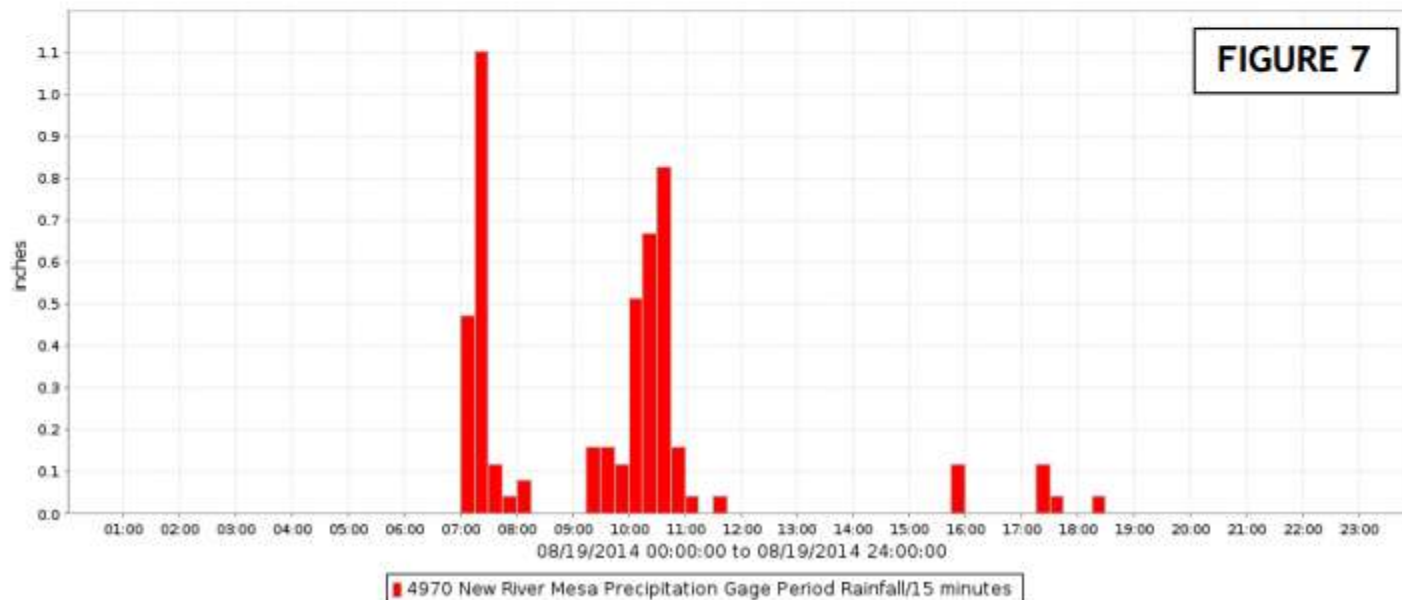






**TABLE II - Precipitation Frequency Estimates (in)  
for New River Mesa # 4970; Elev. 3,960 ft.**

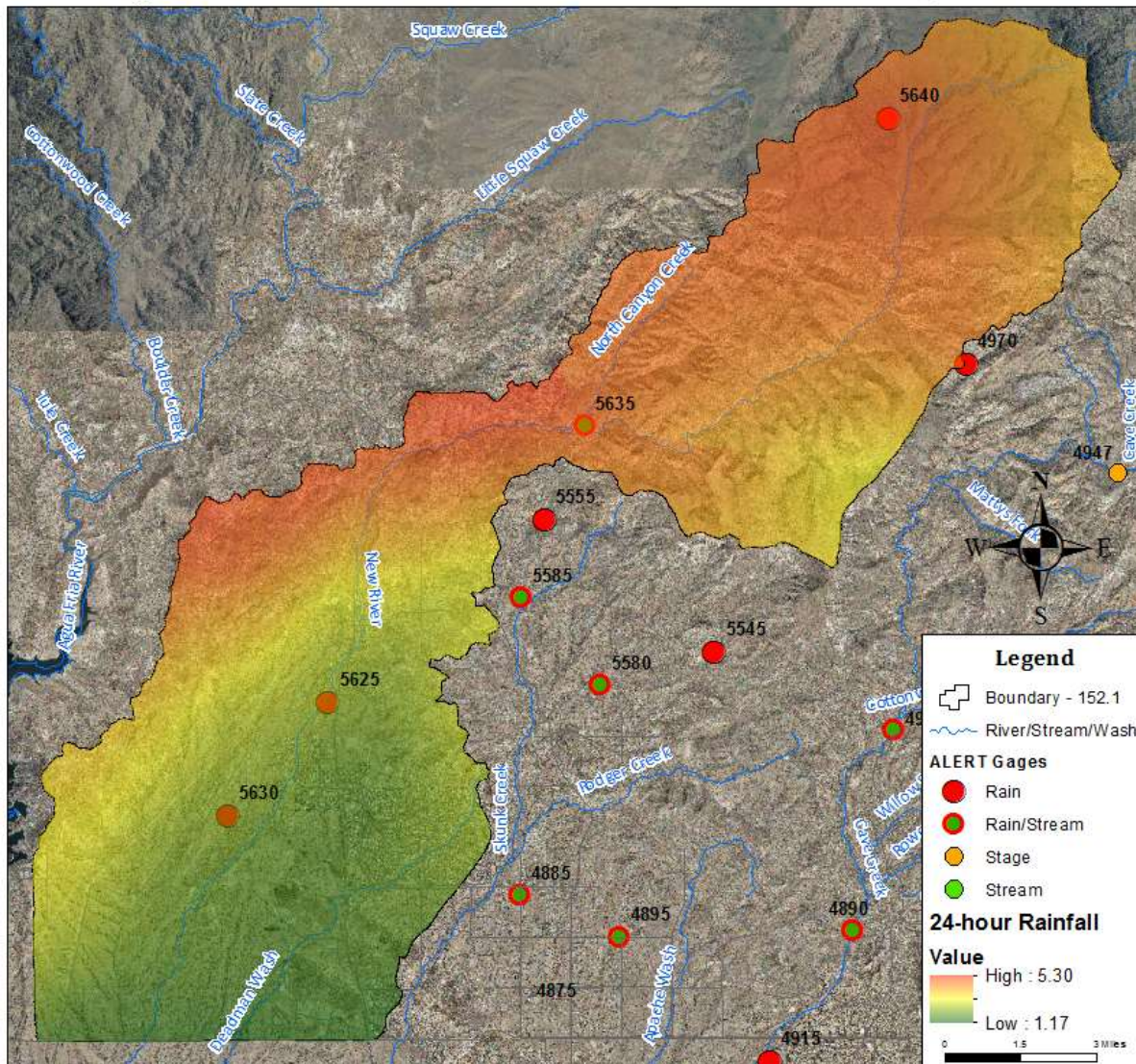
| AEP<br>(1-in-Y) |         | 15<br>min | 30<br>min | 60<br>min | 120<br>min | 3<br>hr | 6<br>hr | 12<br>hr | 24<br>hr |
|-----------------|---------|-----------|-----------|-----------|------------|---------|---------|----------|----------|
| 2               |         | 0.57      | 0.77      | 0.95      | 1.10       | 1.18    | 1.39    | 1.69     | 2.08     |
| 5               |         | 0.83      | 1.12      | 1.39      | 1.57       | 1.66    | 1.89    | 2.27     | 2.90     |
| 10              |         | 1.02      | 1.37      | 1.70      | 1.91       | 2.00    | 2.24    | 2.67     | 3.48     |
| 25              |         | 1.26      | 1.70      | 2.10      | 2.36       | 2.46    | 2.72    | 3.18     | 4.26     |
| 50              |         | 1.45      | 1.95      | 2.41      | 2.71       | 2.82    | 3.09    | 3.57     | 4.89     |
| 100             |         | 1.65      | 2.22      | 2.75      | 3.09       | 3.22    | 3.49    | 3.99     | 5.56     |
| 200             |         | 1.85      | 2.49      | 3.09      | 3.47       | 3.63    | 3.90    | 4.39     | 6.25     |
| 500             |         | 2.14      | 2.87      | 3.56      | 4.02       | 4.21    | 4.46    | 4.94     | 7.23     |
| 1000            |         | 2.37      | 3.19      | 3.94      | 4.46       | 4.69    | 4.91    | 5.40     | 8.01     |
| Rain            | (in)    | 1.26      | 1.65      | 2.24      | 2.64       | 2.72    | 4.49    | 4.80     | 4.80     |
| AEP             | (years) | 25        | 22        | 34        | 44         | 41      | 524     | 396      | 45       |



## Storm over New River Watershed August 19th, 2014

8/19/2014 5:00pm - 8/20/2014 5:00pm

Average Rainfall 3.51" - Total Volume of Water 28,473 ac-ft



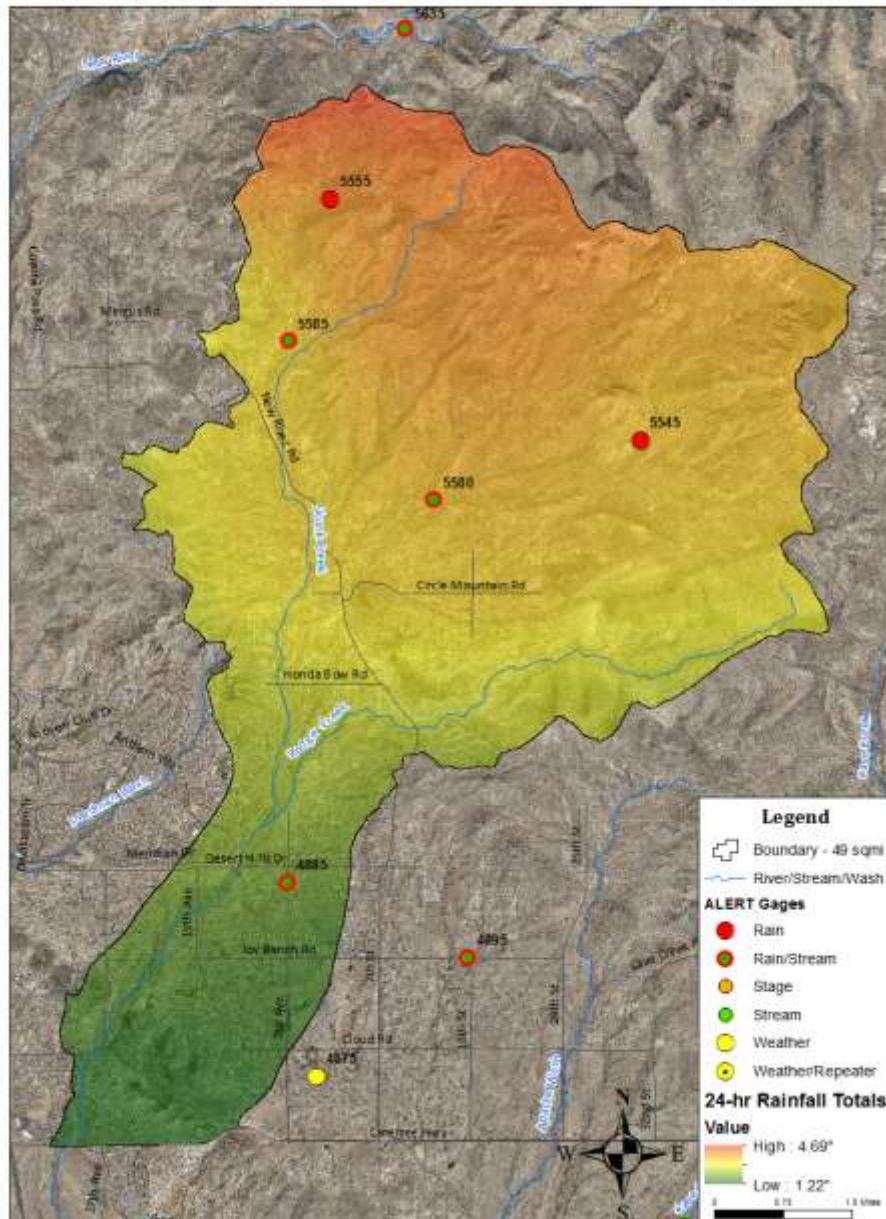
*New River above Carefree Hwy.*

The rain gages in this watershed had an average duration for the heaviest rainfall of 4.5 hours, with an average of 0.26 inches outside that 4.5 hours. The calculated average rainfall includes the estimated rainfall for gage #5640 at the top of the watershed. The MCS2I parameters are 3.07 inches in 4.5 hours over 152 square miles. Its MCS2I score is 8.1





**Storm over Skunk Creek Watershed August 19th, 2014**  
**8/19/2014 5:00pm - 8/20/2014 5:00pm**  
**Average Rainfall 3.04" - Total Volume of Water 7,945 ac-ft**



*Skunk Creek above Carefree Hwy.*

*The rain gages in this watershed had an average duration for the heaviest rainfall of 5 hours, with an average of 0.38 inches outside that 5 hours. So the MCS2I parameters are 2.66 inches in 5 hours over 49 square miles. Its MCS2I score is 7.7*

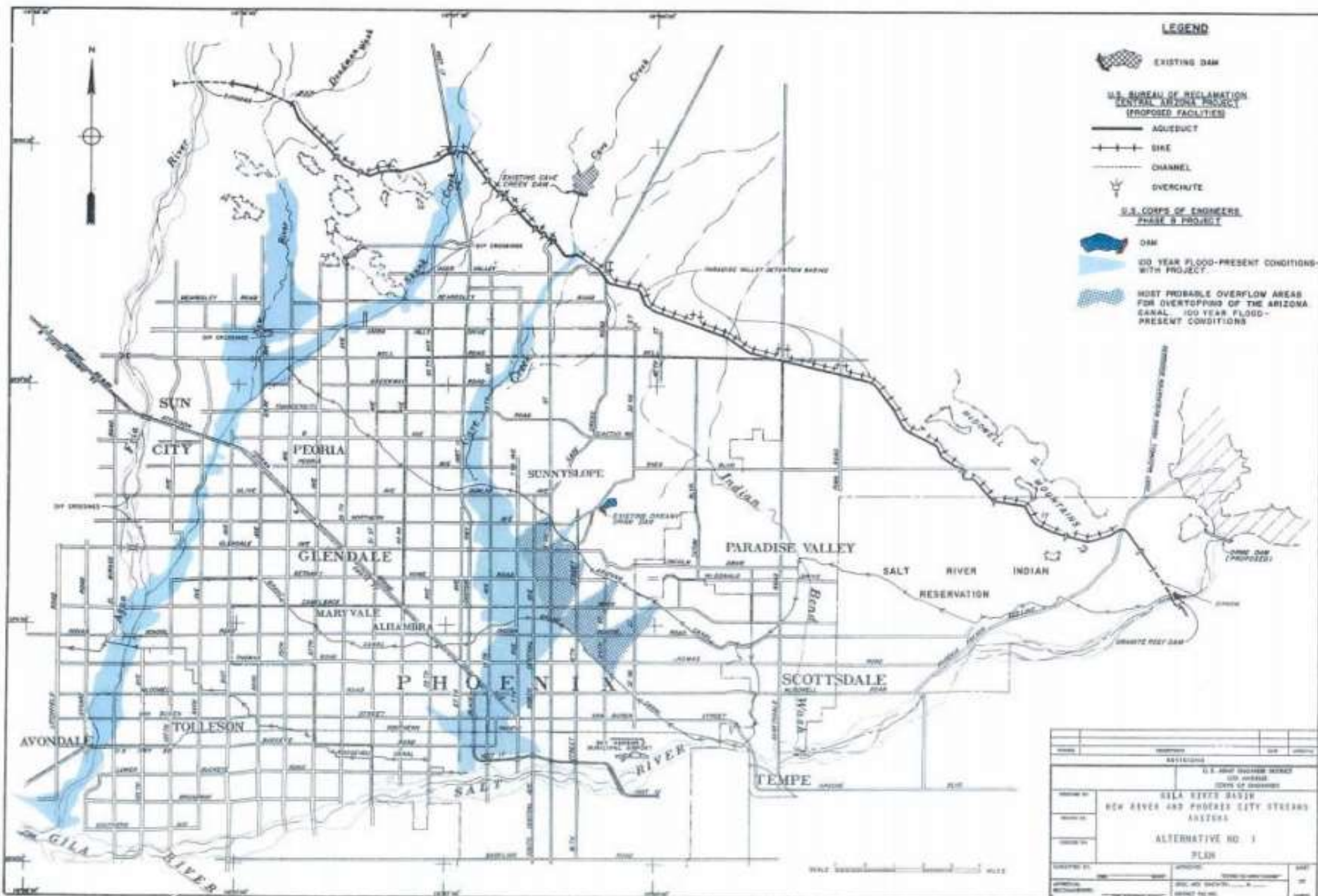


**Table XI - Runoff & Impoundment Summary by Watershed**

| Watershed               | Gage ID         | Gage Name<br>(in downstream order) | Peak Stage<br>from Gage<br>(ft.) | Peak Discharge<br>from Gage<br>(cfs) | Peak Discharge<br>from IM<br>(cfs) | Return<br>Period<br>(years) | Peak<br>Storage<br>(ac-ft) | Peak %<br>Capacity | Date /<br>Time of Peak |
|-------------------------|-----------------|------------------------------------|----------------------------------|--------------------------------------|------------------------------------|-----------------------------|----------------------------|--------------------|------------------------|
| <b>New River</b>        | <b>5638</b>     | New River Fire                     | 11.00                            |                                      | 32,600 (4)                         | Unknown                     |                            |                    |                        |
|                         | <b>09513780</b> | New River near Rock Springs, AZ    |                                  |                                      | 52,000 (3)                         | 320 (1)                     |                            |                    |                        |
|                         | <b>N/A</b>      | New River @ New River Elementary   |                                  |                                      | 39,300 (3)                         | Q <sub>100</sub> =32,000    |                            |                    |                        |
|                         | <b>5614</b>     | New River Dam                      | 30.38                            |                                      |                                    |                             | 5,620                      | 12.9               | 8/19/2014 18:41        |
|                         |                 |                                    |                                  |                                      |                                    |                             |                            |                    |                        |
| <b>Skunk Creek</b>      | <b>5588</b>     | Skunk Creek near New River         | 3.37                             | 1,054                                |                                    | 8 (2)                       |                            |                    | 8/19/2014 7:24         |
|                         | <b>5583</b>     | Cline Creek                        | 7.76                             | 5,953                                | 5,850 (4)                          | 52 (2)                      |                            |                    | 8/19/2014 7:45         |
|                         | <b>N/A</b>      | Cline Creek @ New River Rd.        |                                  |                                      | 7,200 (3)                          | Q <sub>100</sub> =13,747    |                            |                    |                        |
|                         | <b>N/A</b>      | Skunk Creek @ Dove Valley Rd.      |                                  |                                      | 18,700 (3)                         | Q <sub>100</sub> =27,000    |                            |                    |                        |
|                         | <b>5568</b>     | Skunk Creek @ I-17                 | 6.67                             | 13,161 (5)                           |                                    | 20                          |                            |                    | 8/19/2014 10:15        |
|                         | <b>09513860</b> | Skunk Creek near Phoenix, AZ       | 6.61                             | 12,872 (5)                           | 12,700 (3)                         | 19                          |                            |                    |                        |
|                         | <b>5539</b>     | Adobe Dam                          | 13.95                            |                                      |                                    |                             | 990                        | 5.3                | 8/19/2014 15:09        |
|                         |                 |                                    |                                  |                                      |                                    |                             |                            |                    |                        |
| <b>Cave Creek</b>       | <b>4963</b>     | Seven Springs Wash                 | 5.42                             | 1,090                                |                                    | < 2 (2)                     |                            |                    | 8/19/2014 11:53        |
|                         | <b>4947</b>     | Cave Creek @ Ashdale               | 11.24                            | 8,735                                |                                    | (7)                         |                            |                    | 8/19/2014 11:39        |
|                         | <b>4923</b>     | Cave Creek @ Spur Cross Rd.        | Failed                           |                                      | 9,240 (3)                          | 16 (2)                      |                            |                    |                        |
|                         | <b>09512280</b> | Cave Creek blw. Cottonwood Cr.     | Failed                           |                                      |                                    |                             |                            |                    |                        |
|                         | <b>4893</b>     | Cave Creek                         | 12.75                            | 17,190                               |                                    | 28 (2)                      |                            |                    | 8/19/2014 12:28        |
|                         | <b>4918</b>     | Cave Creek near Cave Creek         | 10.30                            | 14,740                               | 15,000 (4)                         | 36 (2)                      |                            |                    | 8/19/2014 12:47        |
|                         | <b>4904</b>     | Cave Buttes Dam                    | 36.77                            |                                      |                                    |                             | 1,977                      | 4.3                | 8/21/2014 19:06        |
|                         |                 |                                    |                                  |                                      |                                    |                             |                            |                    |                        |
| <b>Hassayampa River</b> | <b>5352</b>     | Hassayampa R. @ Wagoner            | 2.18                             | 307                                  |                                    | < 2 (2)                     |                            |                    | 8/19/2014 5:38         |
|                         | <b>5308</b>     | Hassayampa R. @ Box Canyon         | 8.60                             | 3,660                                |                                    | 2 (2)                       |                            |                    | 8/19/2014 14:52        |
|                         | <b>7168</b>     | Antelope Creek                     | 4.54                             | 3,580                                |                                    | 9 (2)                       |                            |                    | 8/19/2014 14:39        |
|                         | <b>7013</b>     | Martinez Creek                     | 8.93                             | 7,600                                |                                    | 8 (2)                       |                            |                    | 8/19/2014 15:00        |
|                         | <b>5228</b>     | Hassayampa R. @ US 60              | Failed                           | (8)                                  |                                    |                             |                            |                    |                        |
|                         | <b>5223</b>     | Hassayampa R. near Morristown      | 9.65                             | 4,720                                |                                    | 3 (1)                       |                            |                    | 8/19/2014 17:57        |
|                         | <b>09516500</b> | Hassayampa R. near Morristown, AZ  | 11.12                            | 4,670                                |                                    | 3 (1)                       |                            |                    | 8/19/2014 18:00        |



# Areas Protected by USCOE Facilities



Monday, September 8, 2014

## Norbert and the Record-Shattering Rainfall

Although Hurricane Norbert never made landfall, its moisture, combined with the residual moisture from the North American Monsoon, increased the rainfall across the Desert Southwest causing flash floods in southern Nevada, southern California and Arizona. Portions of Maricopa County experienced record-breaking rainfall totals from the slow-moving storm while other parts just got a little wet.

Early morning Monday, September 8, many valley residents reported being awakened by bright flashes of lightning and loud crashes of thunder along with heavy rain. Motorists beginning their morning commute along the I-10 found themselves stranded due to standing and rapidly rising flood water that was accumulating at 43rd Avenue. Valley wide, commuters that braved the weather were faced with heavy rain, flooded streets, traffic accidents, detours, sinkholes and malfunctioning traffic lights.

Recognizing the potential danger, schools, college campuses and even some businesses began to close. Other businesses had no choice and had to close their doors due to floodwater in their facilities or rooftops that caved from the weight of the water.

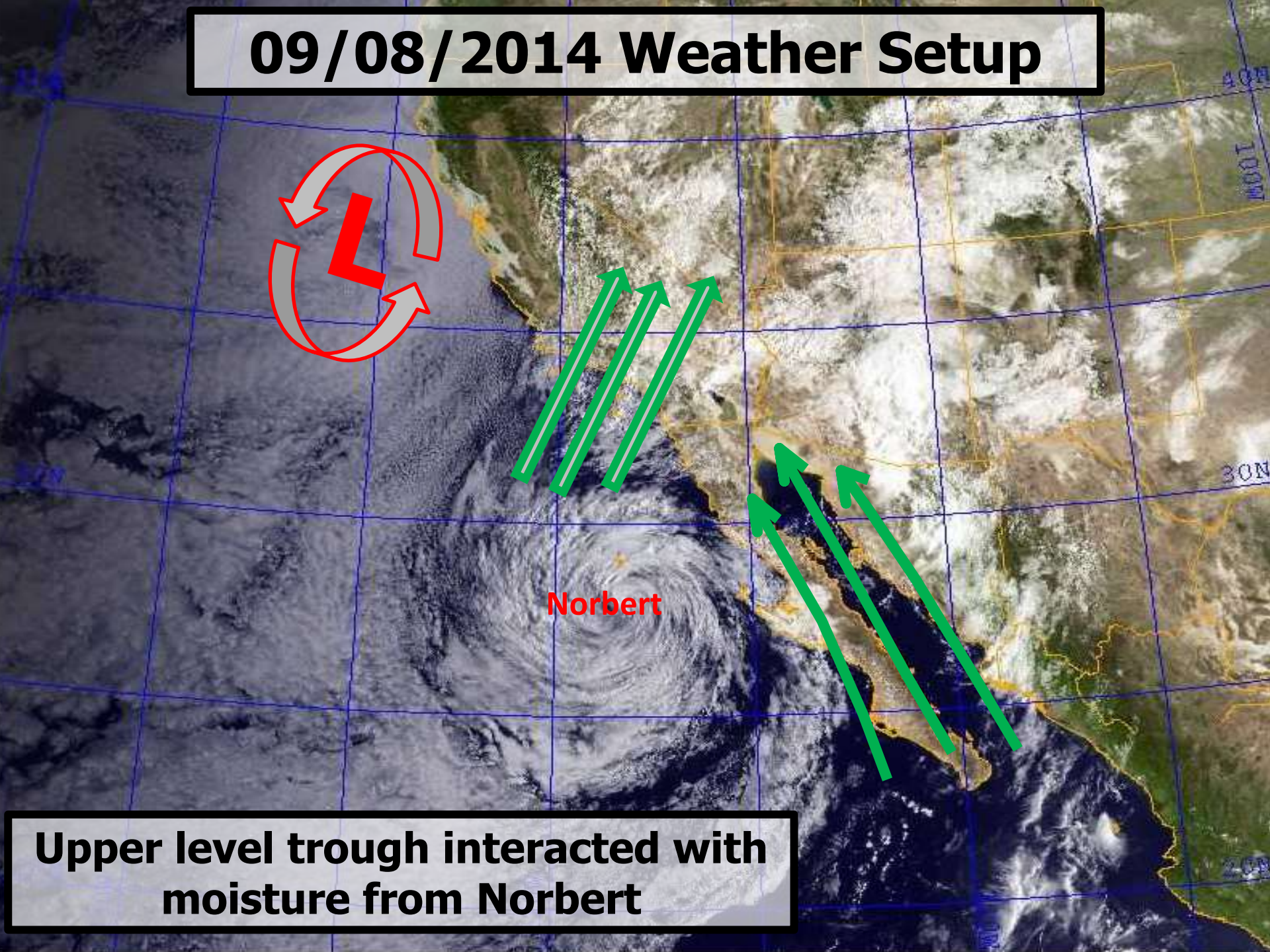
Residents that were in the process of renovating their homes from previous storms were flooding once again. Others watched as basins in their neighborhoods overtopped sending water onto their property and into their homes. Realizing the need for assistance, Phoenix Mayor Greg Stanton and AZ Governor Jan Brewer declared states of emergency.

By day's end, the 2.91-inch rainfall record that was set in 1933 had been broken. Sky Harbor International reported that 3.29 inches of rain had fallen in Phoenix, AZ making September 8 the wettest day on record in 117 years.





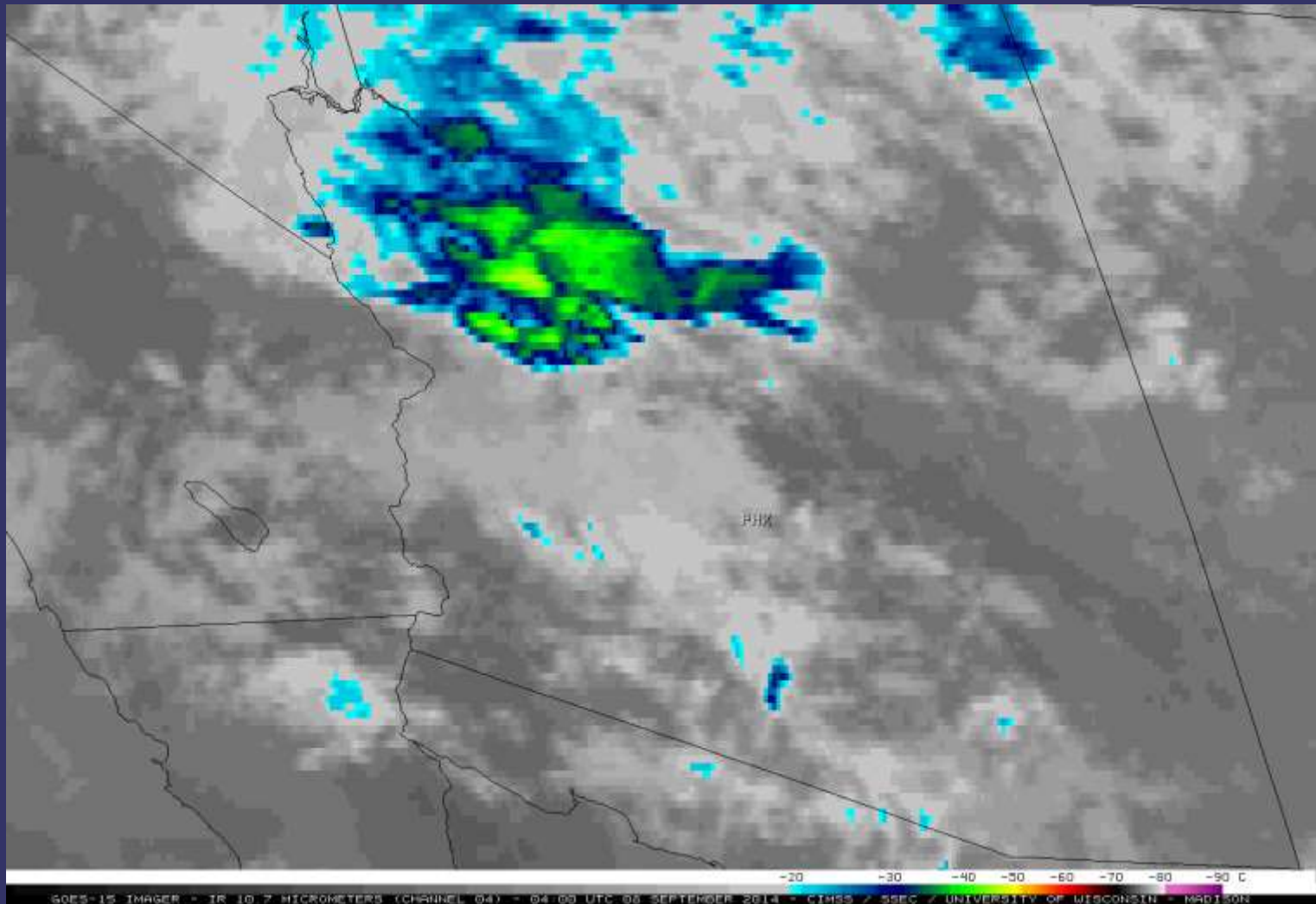
# 09/08/2014 Weather Setup



Upper level trough interacted with  
moisture from Norbert



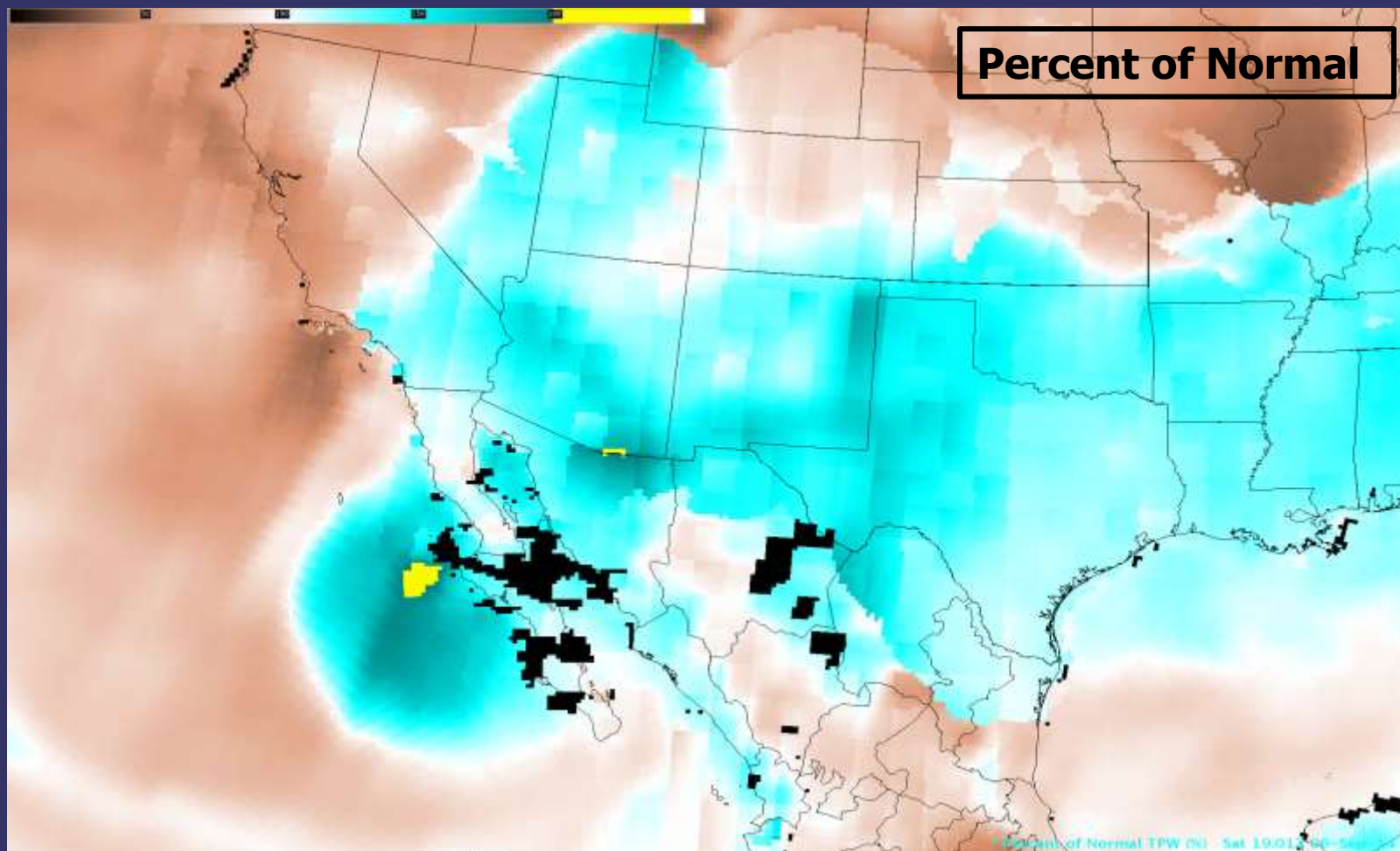
# MCS Merger





# Precipitable Water

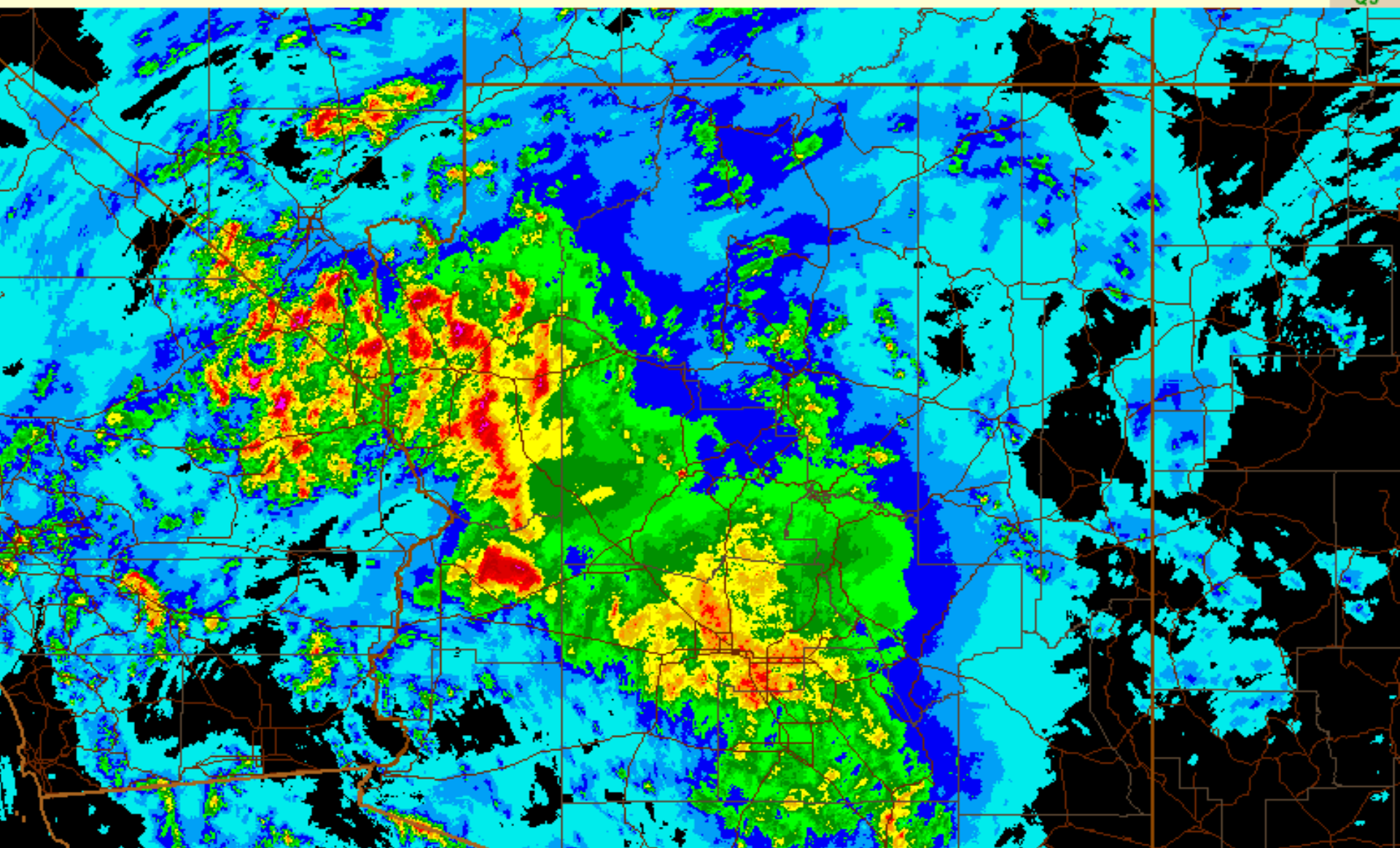
*(Loop during 9/8 rain event)*



# Q3 [Radar Only]

24 hr Accumulation

Valid: 09/08/2014 19:00:00 UTC



Precipitation [in]

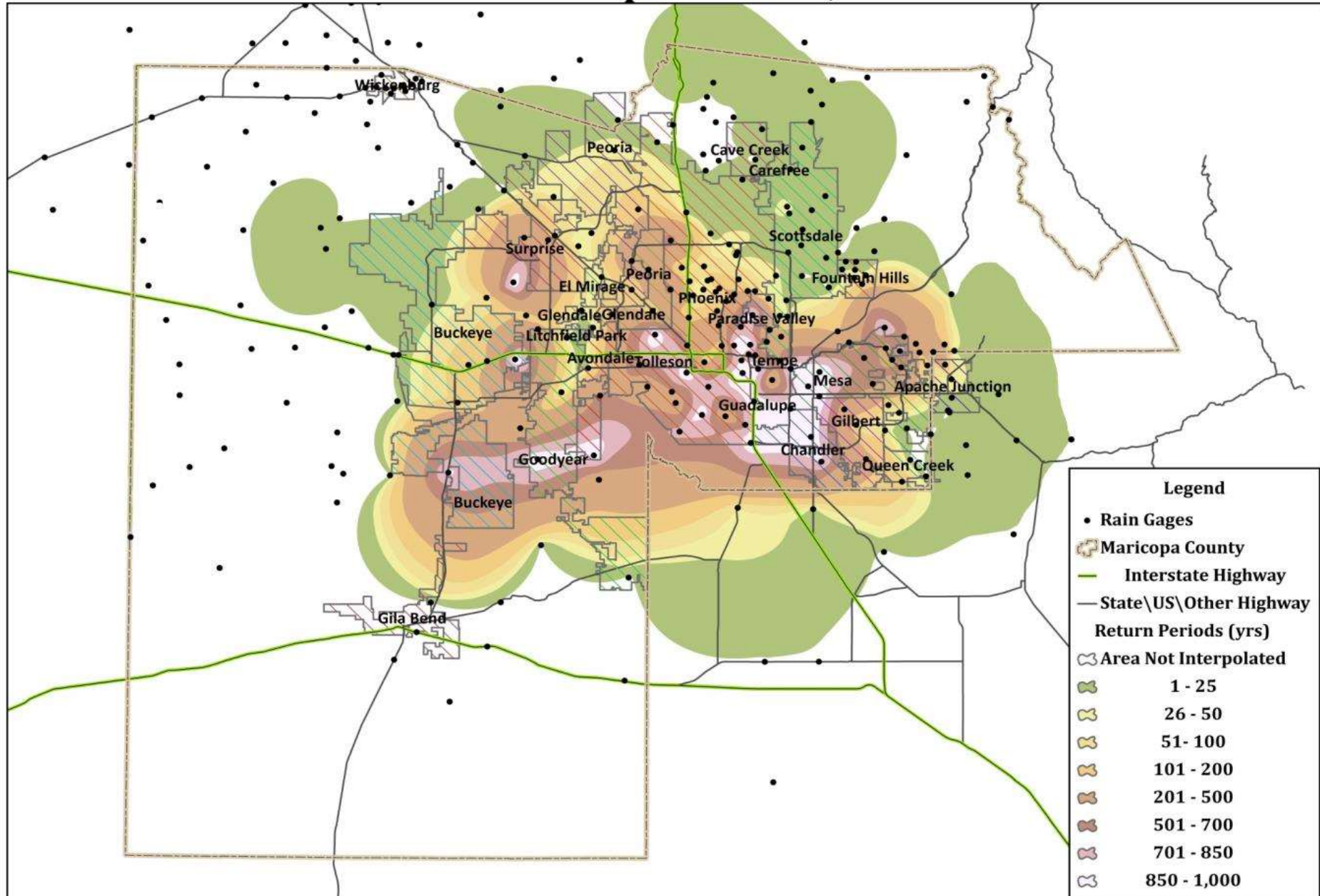
No File Missing



37.48  
-117.41 -107.218  
32.21



# 6 Hour Rainfall Return Periods Storm of September 8, 2014



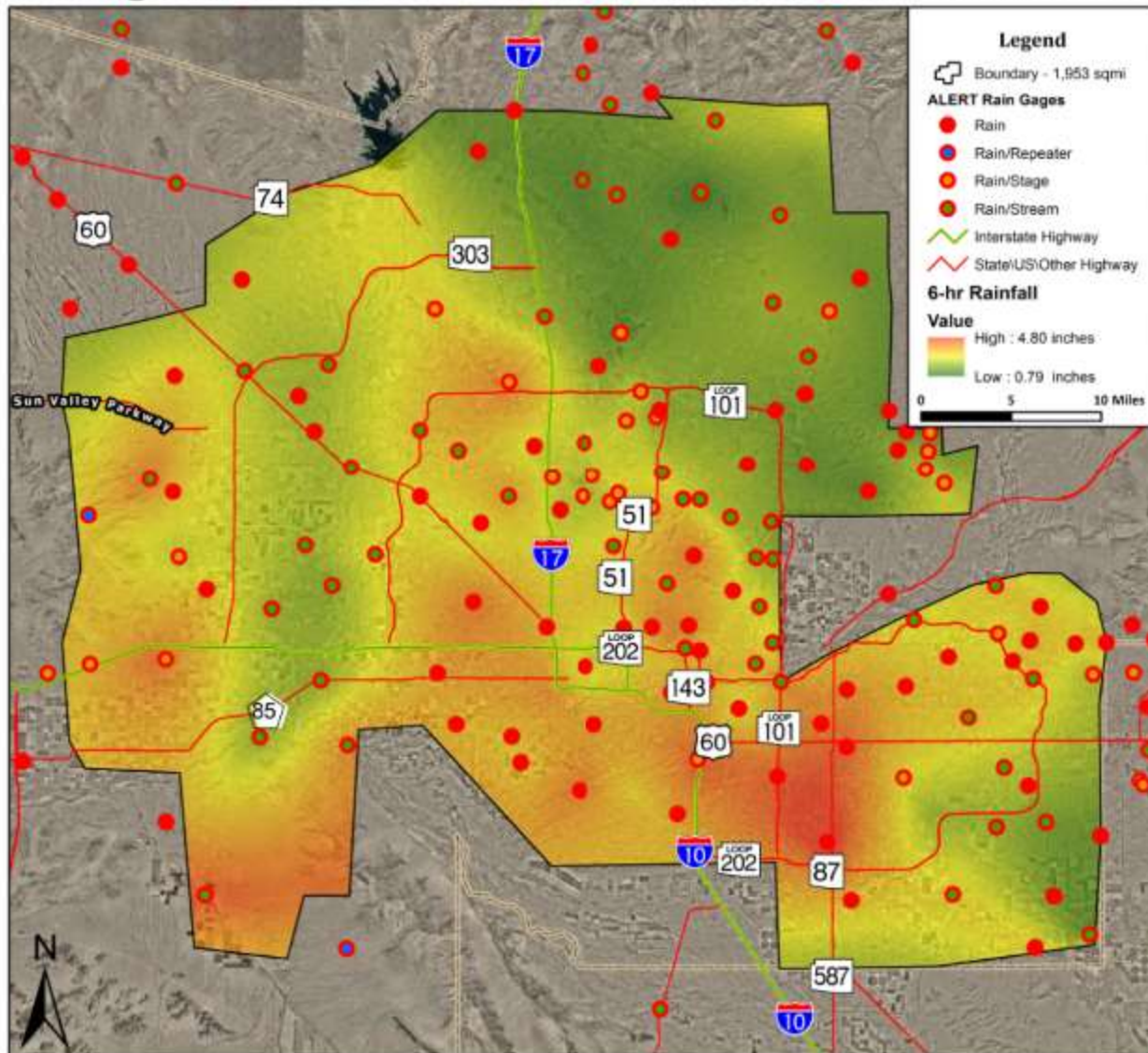
# Fun Sep. 8<sup>th</sup> Storm Facts

- Maximum 15-min. rainfall was 1.46 inches at Paradise Valley Country Club – return period of 357 years.
- Maximum 1-hour rainfall was 2.76 inches at Narrows Damsite – return period of 660 years.
- Maximum 6-hour rainfall was 5.12 inches at Chandler Blvd. @ Alma School – return period of 1,000 years.
- Maximum 12-hour rainfall was 5.51 inches at Chandler Blvd. @ Alma School – also a return period of 1,000 years.
- 26 FCD rain gages had a 3, 6 or 12 hour – 1,000-year rainfall.
- 91 FCD rain gages had a 3, 6 or 12 hour – 100 year rainfall.
- 29 FCD stream gages had their highest-ever recorded flow.
- 16 dams & basins had their highest-ever impoundment.
- 1 FCD basin overtopped by 1 ½ feet – Tatum Basin.
- The amount of rain that fell over metro Phoenix could nearly fill Horseshoe and Bartlett Lakes on the Verde River.
- The FCD website had over 1.1 million hits.





**Phoenix Rain Index September 8th, 2014**  
**6 Hour 9/8/2014 1:00am - 9/8/2014 7:00am**  
**Average Rainfall 2.51" - Total Volume of Water 261,233 ac-ft**

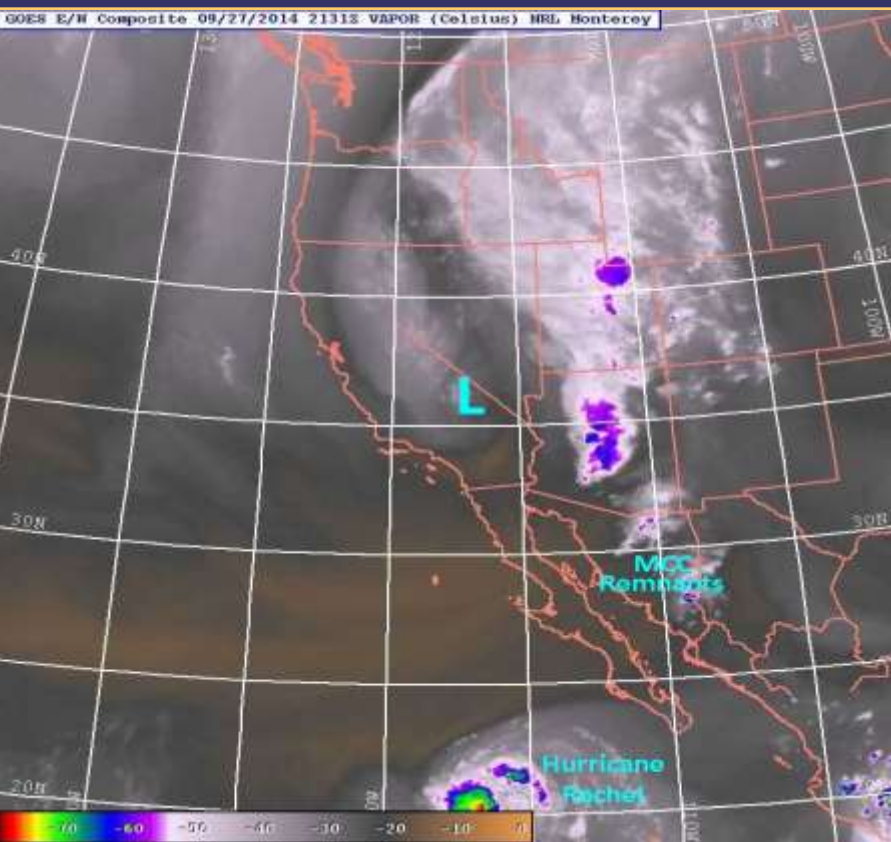


For this storm, inputs to MCS2I were 2.51 inches over 1,953 sq. mi. in 6 hours. Its MCS2I score is **8.8**. For comparison, the storm of Jan. 21, 2010 scored a 7.7 (1.7 inches in 24 hours) and the storm of Aug. 2, 2005 an 8.1 (1.0 inch in 4 hours).





GOES E/W Composite 09/27/2014 2131Z VAPOR (Celsius) HRL Monterey

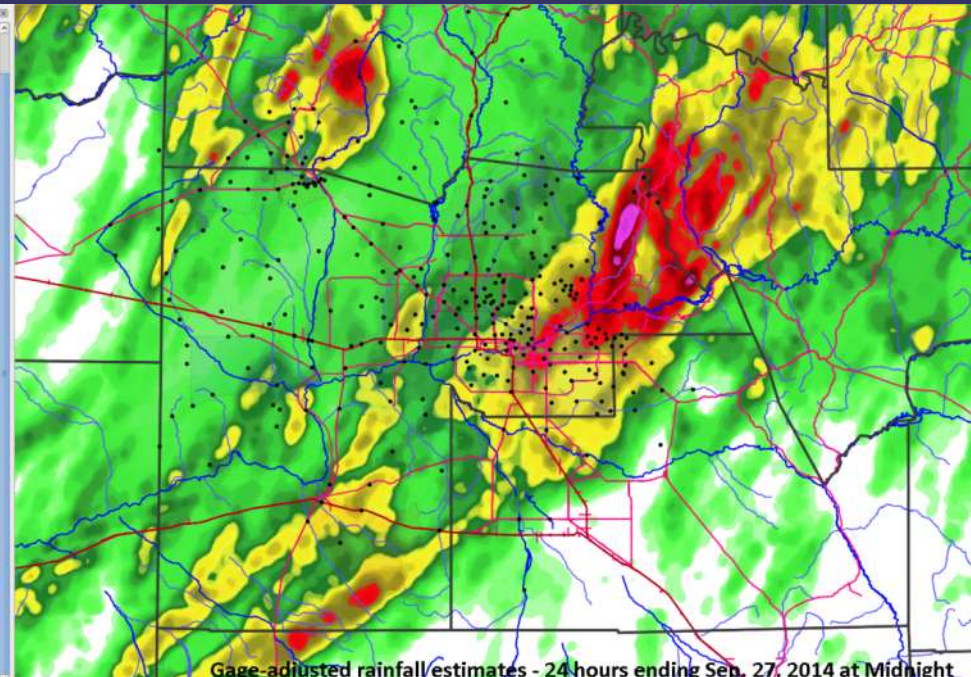
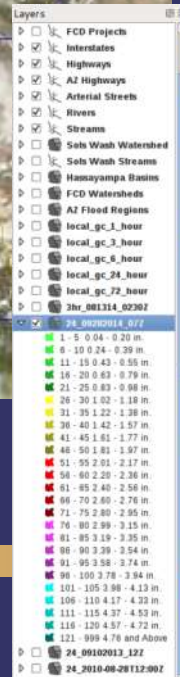
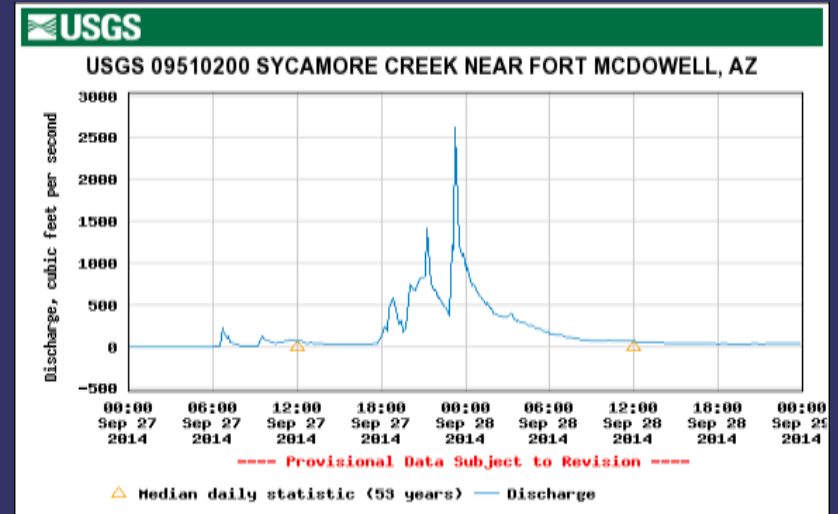


# Sep. 27<sup>th</sup> The Forgotten Storm

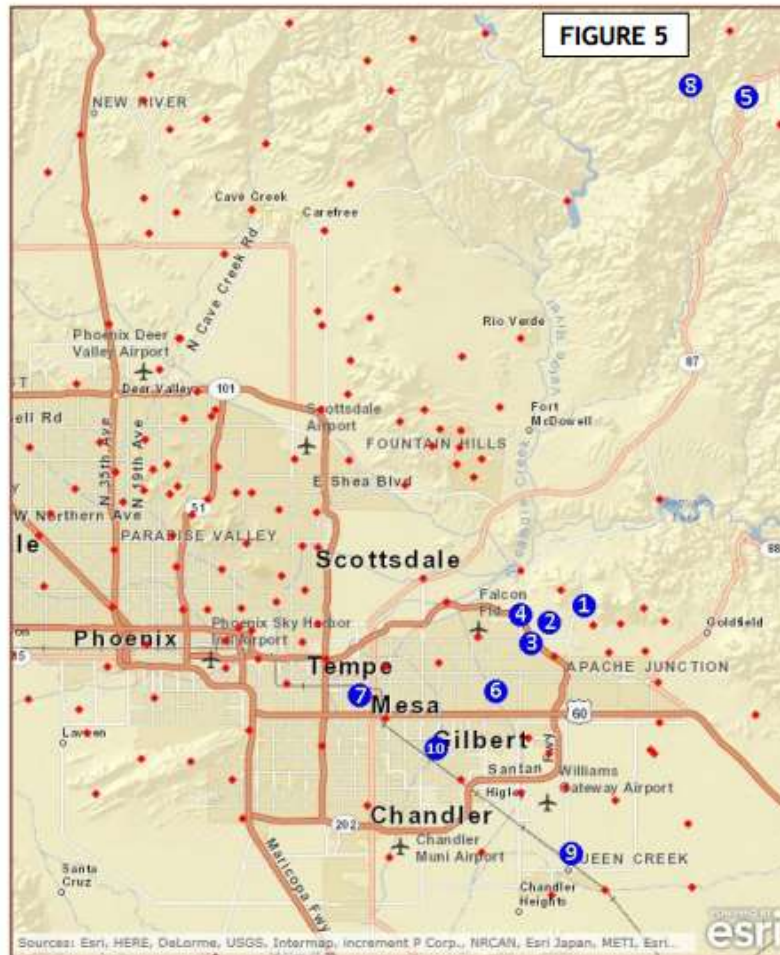




# Sep. 27<sup>th</sup> – The Forgotten Storm



# Sep. 27<sup>th</sup> The Forgotten Storm



- 1) Usery Park  
WS #6650
- 2) McDowell @  
Hawes #6630
- 3) Spookhill @  
McKellips  
#6635
- 4) Spookhill FRS  
# 4560
- 5) Iron Dike  
#5925
- 6) EMF @  
Broadway  
#6570
- 7) Kleinman  
Park #4530
- 8) Sycamore Cr.  
West Fork  
#5875
- 9) Queen Creek  
Rd. #6610
- 10) Freestone  
Basin #6605

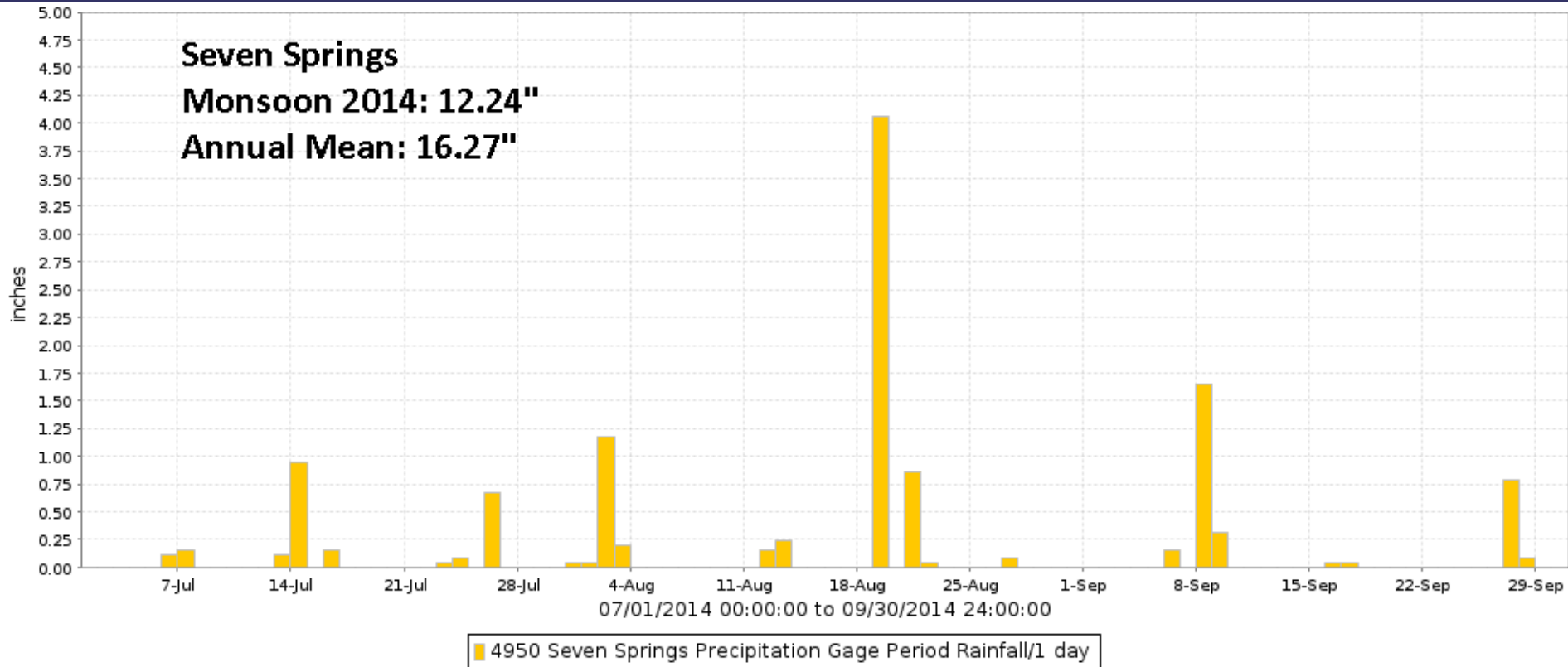
| Return Periods (years) by Duration |         |            |       |       |     |      |      |      |       |       |
|------------------------------------|---------|------------|-------|-------|-----|------|------|------|-------|-------|
| Storm of September 27, 2014        |         |            |       |       |     |      |      |      |       |       |
| Map #                              | Gage ID | Elev. (ft) | 15min | 30min | 1hr | 2hrs | 3hrs | 6hrs | 12hrs | 24hrs |
| 1                                  | 6650    | 2,115      | 18    | 8     | 4   | 10   | 54   | 52   | 26    | 8     |
| 2                                  | 6630    | 1,750      | 5     | 2     | 3   | 8    | 37   | 39   | 23    | 8     |
| 3                                  | 6635    | 1,590      | 4     | 3     | 4   | 9    | 43   | 50   | 34    | 10    |
| 4                                  | 4560    | 1,580      | 4     | 4     | 9   | 18   | 53   | 42   | 28    | 8     |
| 5                                  | 5925    | 4,510      | 2     | 2     | 2   | 2    | 3    | 4    | 2     | 2     |
| 6                                  | 6570    | 1,340      | 4     | 6     | 4   | 8    | 35   | 42   | 30    | 10    |
| 7                                  | 4530    | 1,220      | 5     | 3     | 10  | 33   | 48   | 30   | 27    | 10    |
| 8                                  | 5875    | 4,930      | 2     | 2     | 2   | 4    | 5    | 3    | 2     | 2     |
| 9                                  | 6610    | 1,410      | 4     | 11    | 11  | 28   | 54   | 30   | 21    | 8     |
| 10                                 | 6605    | 1,245      | 4     | 2     | 4   | 13   | 37   | 29   | 12    | 9     |

**TABLE I**



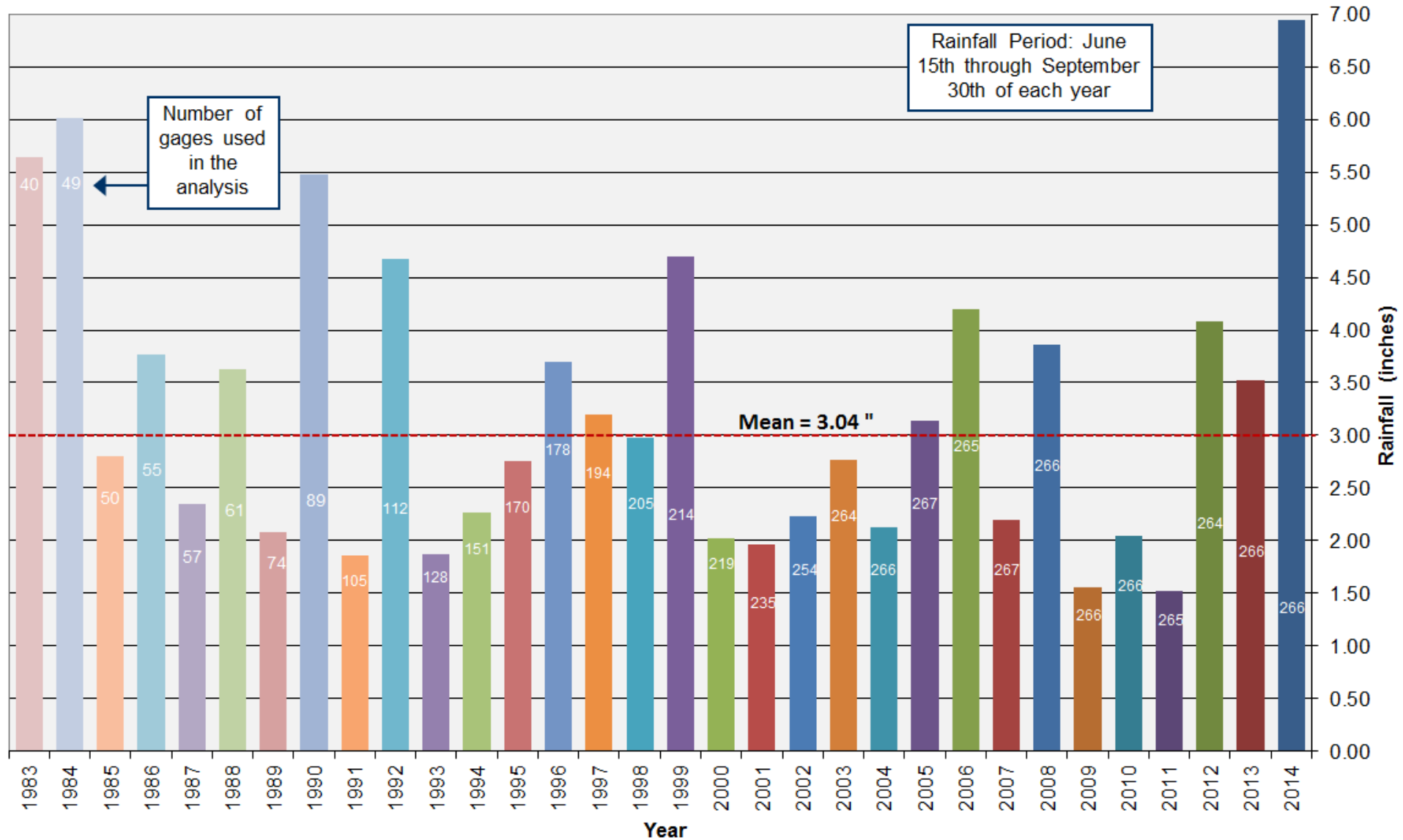


# Daily Rainfall – July 1 through Sept. 30

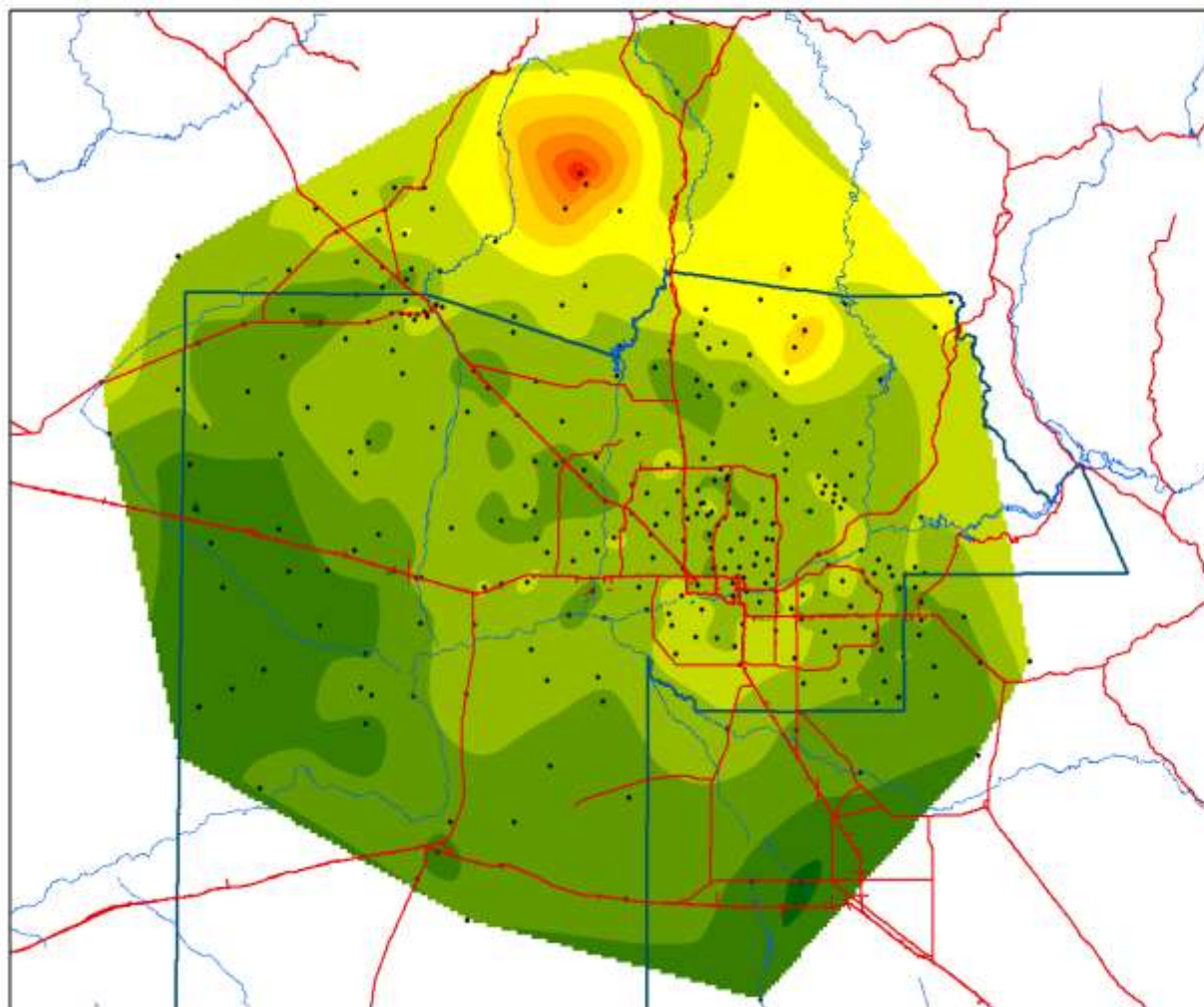


# Average Summer Thunderstorm Season Rainfall

Flood Control District of Maricopa County ALERT Rain Gages







#### LEGEND

- Major Rivers
- Freeways\_Highways
- Maricopa\_County
- gages\_Monsoon\_2014

#### <VALUE>

- 1.4 - 2.0 inches
- 2.1 - 4.0
- 4.1 - 6.0
- 6.1 - 8.0
- 8.1 - 10.0
- 10.1 - 12.0
- 12.1 - 14.0
- 14.1 - 16.0
- 16.1 - 18.0
- 18.1 - 20.0
- 20.1 - 22.0

This map created by the Flood Warning Branch, Flood Control District of Maricopa County, Phoenix AZ, from automated rain gage data. The user assumes all risk related to use of this map. FCDMC provides this map "as is," and disclaims any and all warranties, whether express or implied, including (without limitation) any implied warranties of merchantability or fitness for a particular purpose. In no event will FCDMC, or any of its employees, be liable to the user or any third party for any direct, indirect, consequential, special or exemplary damages or lost profit resulting from any use or misuse of this map or the data contained therein.

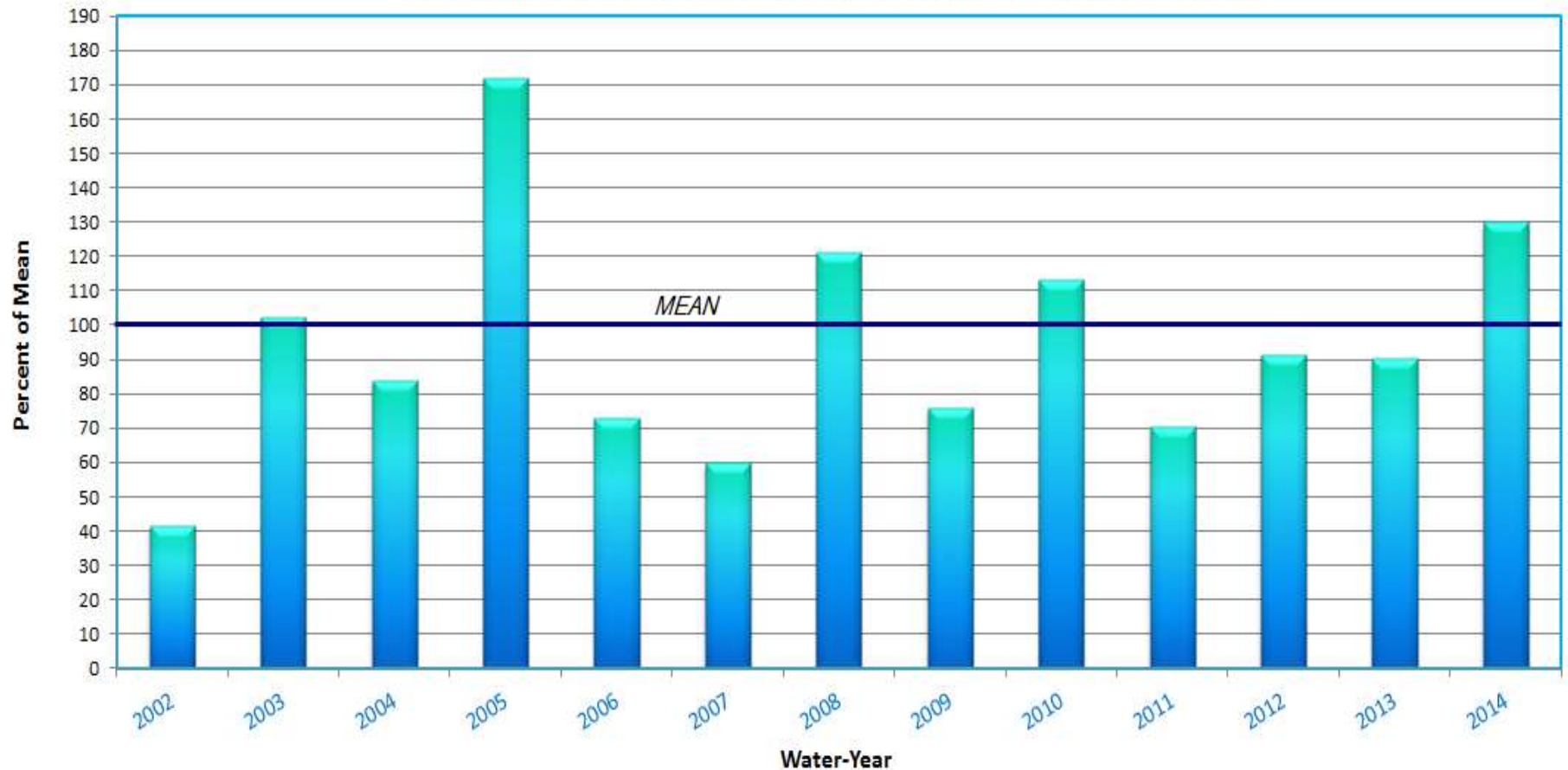


Created 10/15/2014 SDW

Rainfall Totals at ALERT Gages: Jun. 15 - Sep. 30, 2014



## Average Percent of Annual Mean Precipitation for FCDMC ALERT Stations with 10 or More Years of Record





# Data Sources/References

- SST Anomaly Data, NOAA/NESDIS:  
<http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/>
- Satellite Imagery, Naval Research Laboratory:  
[http://www.nrlmry.navy.mil/sat\\_products.html](http://www.nrlmry.navy.mil/sat_products.html)
- Satellite Imagery, University of Illinois, Atmo. Sciences Dept:  
<http://ww2010.atmos.uiuc.edu/%28Gh%29/wx/satellite.rxml>
- Satellite Imagery, Unisys Weather:  
[http://weather.unisys.com/archive/sat\\_ir/](http://weather.unisys.com/archive/sat_ir/)
- 2014 Eastern Pacific Tropical Cyclone Tracks, NOAA/NHC:  
<http://www.nhc.noaa.gov/?epac>
- Radar Imagery, weather toolkit, NOAA/NCDC:  
<http://www.ncdc.noaa.gov/oa/radar/radardata.html>
- Radar Q3 Imagery, University of Oklahoma/NOAA, NMQ:  
<http://www.fcd.maricopa.gov/Rainfall/rainfall.aspx>
- Record rainfall and flooding in Arizona: Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin, Madison:  
<http://cimss.ssec.wisc.edu/goes/blog/archives/date/2014/09/08>



# Thank You! Questions...?

## Storm Reports:

<http://www.fcd.maricopa.gov/Rainfall/publications.aspx>

Dust Storm, 07-03-2014, D. Henz



*[www.fcd.maricopa.gov](http://www.fcd.maricopa.gov)*



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